This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

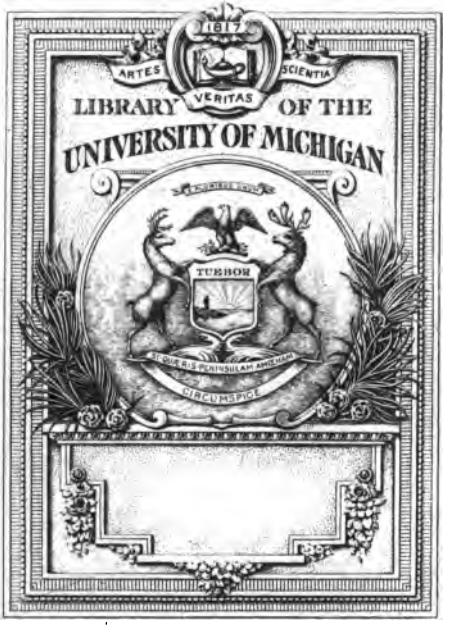
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`


1817
ARTES
SCIENTIA
VERITAS
LIBRARY OF THE
UNIVERSITY OF MICHIGAN
TUEBOR
CIRCUMSPICE

TC
224
.M4
A3

COMPLIMENTS OF

Board of Harbor and Land Commissioners

WILLIAM S. McNARY, CHAIRMAN,
CHARLES C. PAINE,
GEORGE M. HARLOW,

STATE HOUSE,
BOSTON.

FREDERICK N. WALES, CLERK OF BOARD.

Public Document **No. 11**

THIRTY-FIFTH ANNUAL REPORT

OF THE

BOARD OF HARBOR AND LAND COMMISSIONERS.

FOR THE YEAR 1913.

BOSTON:
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,
32 DERNE STREET.
1914.

APPROVED BY
THE STATE BOARD OF PUBLICATION.

UNIVERSITY OF CHICAGO
LIBRARIES
266892
MARCH 1930

The Commonwealth of Massachusetts.

REPORT.

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts.

The Board of Harbor and Land Commissioners, pursuant to the provisions of law, respectfully submits its annual report for the year 1913, covering a period of twelve months, from Nov. 30, 1912, being the thirty-fifth annual report of the Board since its establishment by chapter 263 of the Acts of 1879.

The present organization of the Board is as follows: William S. McNary of Boston, chairman, George E. Smith of Swampscott, Charles C. Paine of Barnstable.

From Dec. 1, 1912, to Nov. 30, 1913, the Board has given 185 formal and informal hearings, and has received 178 petitions for the improvement and protection of rivers, harbors and foreshores, for licenses to build and maintain structures, for privileges in tide waters, great ponds and Connecticut River, to dredge material, to remove material from beaches and for other purposes.

One hundred and seventeen licenses for structures and privileges in tide waters, great ponds and Connecticut River have been granted during the year; also 22 permits for dredging, the removal of material from beaches and for other purposes.

Inspections have been made at various times, by and under the direction of the Board, of work completed and in progress; of sites of authorized work under appropriations made by the Legislature; also upon petitions and plans presented of the sites of proposed work in tide waters; of rivers and harbors, on petitions for improvement under chapter 481 of the Acts of 1909, and chapter 642 of the Acts of 1912; work done and in

progress on Cape Cod Canal; various structures built under licenses; town boundary survey work.

During the year 18 contracts were made, involving the estimated expenditure of $171,007.45. A list of these contracts and those pending, with details relating thereto, may be found in the Appendix.

The Improvement and Protection of Rivers, Harbors, Tide Waters and Foreshores.

By chapter 481 of the Acts of the year 1909 the Board was authorized and directed to undertake such work for the improvement, development, maintenance and protection of rivers, harbors, tide waters and foreshores within the Commonwealth as it may deem to be reasonable and proper, and to expend during the years 1910, 1911 and 1912 a sum not exceeding $300,000, not more than $100,000 to be expended in any one year, provided, however, that an unexpended balance in any year might be used in the succeeding year.

This act also provided that the Board shall consider the general public advantage of the proposed work, the local interest therein as manifested by municipal or other contributions therefor, the importance of the industrial or commercial and other interests to be especially served thereby, and any other material considerations affecting the feasibility, necessity or advantage of the proposed work or the expenditure therefor. It was further provided that no work shall be commenced until after a public hearing has been held and a survey and estimate of cost has been made; that a city or town might appropriate money for the improvement of rivers, harbors, tide waters and foreshores within its jurisdiction, the money so appropriated to be paid into the State treasury, to be expended by the Board for said purposes; and that the city or town might assume liability for all damages to property suffered by any person by any taking of land, or of any right, interest or easement in land within the city or town made by the Board for the purposes authorized by the act. By chapter 642 of the Acts of 1912 the Board is authorized —

To expend during the years nineteen hundred and thirteen, nineteen hundred and fourteen and nineteen hundred and fifteen, a sum not exceed-

ing four hundred and fifty thousand dollars for the improvement, development, maintenance and protection of rivers, harbors, tidewaters and foreshores within the commonwealth now under the jurisdiction of said board. . . . The board shall not expend more than one hundred and fifty thousand dollars in any one year, except that an unexpended balance in any year may be used in the succeeding year for the said purpose.

The total expenditure by the State from 1893 to Dec. 1, 1913, for river and harbor work, exclusive of that in Boston main harbor, as shown on page 6, report for 1912, was $2,092,-640.53.[1]

It is apparent that $150,000 per year is utterly inadequate to meet the demands made upon this Board for allotments for river and harbor improvements throughout the State. The necessity for a larger amount was manifested before the legislative committee on harbors and public lands at the last session of the Legislature. A broad and comprehensive bill providing for the expenditure of $5,000,000 in five years at the rate of $1,000,000 per year, for work of that character, failed of passage by a narrow margin only.

There has been prepared and already filed, as required by law, a bill embodying the recommendations of the Board, authorizing it to expend in addition to the unexpended balance of the appropriation under chapter 642 of the Acts of 1912, for the examination, survey, improvement, development, protection, preservation and maintenance of rivers, streams, harbors, tide waters, foreshores, coast lines and river banks, excepting Boston harbor, amounts named in the bill and applicable to certain rivers and harbors.

Petitions under the Acts of 1909 and 1912 aforesaid have been filed during the year for surveys and improvements in the following localities: Beverly harbor; Bucks Creek, Chatham; Centreville River; Connecticut River, at Agawam, Chicopee and Hatfield; Cuttyhunk; Duxbury Bay; Eel Pond, Falmouth; Fall River harbor; Gloucester harbor; Green Hill, Hull; Little or Leman's Pond, Falmouth; Lynn harbor; Manchester harbor; Nonquitt, Dartmouth; Pamet River, Truro; Paskamansett River, Dartmouth; Rock harbor, Orleans;

[1] See Appendices B and C.

Salters Point, Dartmouth; Scituate harbor; South Watuppa Pond, Fall River; South River, Salem; Wild harbor, Falmouth; and Witchmere harbor.

The action taken upon these several petitions, as well as statements concerning Boston harbor and other harbors and rivers, and the various surveys, examinations and improvements made between 1893 and Nov. 30, 1913, inclusive, follow.

Bass River, Yarmouth.

Between 1901 and 1910 this river was improved by building two timber jetties at its mouth and excavating a channel between the jetties and across the flats to a depth of 4 feet at mean low water, and by providing a channel 100 feet wide on the bottom from the deep water between the jetties through the flats to the deep water in the sound, a distance of about 1,700 feet. The total expenditure to Dec. 1, 1910, was $47,471.72.

In 1911 further protective work was done on the westerly jetty at a total cost of $5,088.88.

In May, 1912, a petition of the selectmen of the town of Yarmouth and others, under the provisions of chapter 481 of the Acts of 1909, for further improvement of this river by dredging, was presented. Hearing was held and a survey made to determine the existing conditions of a portion of the channel and estimate the cost of further dredging.

It is estimated that the cost of dredging the main channel and a spur channel would be about $20,400.

Amount expended during the year, $328.20.

Total amount expended to Dec. 1, 1913, $52,888.80.

Beverly Harbor.

On June 21, 1912, a communication was received from the mayor of Beverly, under the provisions of chapter 481 of the Acts of 1909, suggesting that a survey be made of Beverly harbor.

There have been no expenditures by the Commonwealth under the direction of this Board for the improvement of Beverly harbor by dredging nor for the construction of any harbor works. The River and Harbor Act, approved July 25, 1912, provided for a preliminary examination and survey of this

harbor. This work was undertaken by the district engineer officer at Boston, who submitted to the Chief of Engineers, U. S. A., two reports dated Sept. 25, 1912, and June 10, 1913, respectively. The project proposed by the federal government particularly concerns the Commonwealth of Massachusetts, and is described in the following general statement, which also includes an account of the work done in this harbor.

In its original condition this harbor had a practicable channel 18 feet deep at mean low water from Monument Bar beacon about 1 mile to its head, about 600 feet below the highway bridge, sufficient for the commerce of the harbor and of its three tributary streams, called, respectively, North River, Essex Branch, and Beverly Creek; but the channel, which is circuitous in its passage through the shoals at the entrance, was found, in 1900, to be "of insufficient width for safe navigation by heavy vessels."

The original project, adopted by the act of June 13, 1902, was to widen the channel from Monument Bar beacon to a point about 200 feet east of Rams Horn beacon to a width of 200 feet, with a depth of 18 feet at mean low water, at an estimated cost of $10,000. Upon the original project, prior to operations under the existing project, $8,272.10 was expended, with which the channel was enlarged to the dimensions authorized, except at three points, where the width was restricted by ledges to 106 feet.

The existing project, adopted by the act of March 2, 1907 (H. Doc. No. 916, 59th Cong., 1st sess., with map), is to obtain, by dredging and rock excavation, a channel 18 feet deep at mean low water, not less than 250 feet wide at the bend for a distance of about 3,200 feet from Bar beacon to Lobster Rocks beacon, including the removal of the middle ground, and not less than 200 feet wide from Lobster Rocks beacon to the lower end of the draw pier at the highway bridge, a distance of 2,000 feet, at an estimated cost of $40,000. In addition to $1,727.90 available, $38,500 was appropriated. No modification has been made in the existing project since its adoption.

Owing to the inadequacy of the channel at the bend near Rams Horn beacon to accommodate the large coal and oil steamers using this port, with the balance of $13,485 remaining after completion of the project, the width of channel at this point is being increased by about 100 feet.

The amount expended on the existing project to June 30, 1913, was $27,960 (all for improvement, except $15 expended in fiscal year 1911 for making an examination of a shoal complained of by navigation interests, but which was found to be outside the limits of the improved channel).

The maximum draft that can be carried on June 30, 1913, at mean low water over the shoalest part of the locality under improvement is

18 feet, excluding the area now being widened, on which the least depth is about 15 feet. The mean range of tide is 9 feet.

The commerce of Beverly Harbor consists chiefly of coal and oil, amounting in 1909 to 196,203 short tons, in 1910 to 204,697 short tons, in 1911 to over 244,000 short tons, and in 1912 to 325,063 short tons (valued at $2,173,365.42), of which 244,425 tons were coal and 71,131 tons oil.

The improvement to 18-foot depth has effected a reduction in freight rates of 25 cents per ton on bituminous coal.

As the funds available are sufficient for completing the widening of the channel, and as no work in maintenance of the improved channel is necessary, no estimate of additional funds required is submitted.

COMMERCIAL STATISTICS.

ARTICLES.	1908.	1909.	1910.	1911.
	Short tons.	*Short tons.*	*Short tons.*	*Short tons.*
Coal	137,256	143,141	151,492	157,539
Lumber	4,461	7,291	8,678	8,063
Oil	77,487	44,135	41,946	77,664
Sand	1,165	688	1,088	390
Stone	1,200	–	–	–
Iron	867	400	175	112
Asphaltum	792	498	–	719
Tar	500	–	–	–
Lime	–	50	60	86
Barrels	–	–	1,258	–
Machinery, etc.	–	–	–	50
Miscellaneous	205	–	–	–
Total	223,933	196,203	204,697	244,623[1]

[1] Incomplete.

Vessel Classification, 1912.

CLASS.	American.	Foreign.	Total.	Total net registered tonnage.
Registered:				
Steamers	36	–	36	74,494
Sailing vessels	74	1	75	45,804
Barges	57	–	57	34,028
Unregistered:				
Sailing vessels	1	2	3	–
Unrigged	4	–	4	–
Total	172	3	175	154,326

Freight Traffic.

Articles.	Amount (customary units).	Amount in short tons.	Valuation.
Coal	244,425 short tons	244,425	$780,048 68
Oil	480,361 barrels 462,919 gallons	71,131	1,266,101 22
Tar	200 barrels	50	300 00
Lumber	3,727,904 feet 29,416 pieces	6,214	95,929 03
Iron	1,050 short tons	1,050	26,250 00
Sand	2,100 short tons	2,100	1,680 00
Pipe	90 short tons	90	2,547 74
Rope	5,787 pounds	3	508 75
Total		325,063	$2,173,365 42

Appropriations.

June 13, 1902	$10,000 00
Mar. 2, 1907	38,500 00
Total appropriations	$48,500 00
Damages from surety of failing contractor	122 24
	$48,622 24
July 1, 1912, balance unexpended	$13,485 00
June 30, 1913, amount expended during fiscal year, for works of improvement	1,094 86
July 1, 1913, balance unexpended	$12,390 14
July 1, 1913, outstanding liabilities	78 50
July 1, 1913, balance available	$12,311 64
July 1, 1913, amount covered by uncompleted contracts	$11,262 89

The total expenditure by the federal government for the improvement of Beverly harbor, to June 30, 1913, is $36,172.10.

The Chief of Engineers, under date of Sept. 3, 1913, reported as follows: —

After due consideration of the above-mentioned reports [Sept. 25, 1912, and June 10, 1913] I concur in general with the views of the district officer, the division engineer, and the Board of Engineers for Rivers and

Harbors, and therefore, in carrying out the instructions of Congress, I report as follows: —

That the improvement by the United States of Beverly Harbor, Mass., with a view to securing a channel depth of 24 feet and of widening the channel on the northern side by the removal of the ledge near the Essex bridge, is deemed advisable so far as to secure an available channel depth of 24 feet and a channel width of 200 feet, increased at entrances and on curves, by way of the northerly route shown on accompanying map, at an estimated cost of $173,000 for first construction, provided that suitable bulkheading inclosing a sufficient area at and to the eastward of Tucks Point be furnished by the State or municipalities to afford a dumping place for dredge spoil; that the United States be permitted to pump behind said bulkhead such material as economically can be excavated with a pump dredge; that the State or city provide a dump basin and rehandle such dredge spoil as cannot be economically pumped ashore directly by the United States; that the United States shall have the right to determine the methods of excavation to be adopted; that all land formed by the deposit of spoil behind the bulkhead shall be pledged by the State or municipality as a permanent site for public wharves open to all water carriers on equal terms, and that prior to the initiation of federal work a cash deposit of $50,000 be made to the credit of the Secretary of War, to be applied to dredging the 24-foot channel along the northern route. The full share of the cost of the improvement to be borne by the United States, $123,000, should be provided in one appropriation, the improved channel to be maintained by the State or municipality. The removal of the ledge near the Essex bridge in the manner apparently desired by the interests concerned, is not deemed advisable at the present time.

Subsequent to this report a communication was received by this Board from a committee of the city of Beverly, requesting an appropriation or allotment of $50,000 by the State for use in complying with the conditions specified in the report of the United States Engineer Officer.

In reply to this communication the Board stated that there does not appear to be any reason why it should not co-operate with the city authorities and others in urging a sufficient appropriation by the incoming Legislature for the further improvement of this harbor.

The Board recommends an appropriation of $50,000 by the Legislature for the purpose of complying with the conditions concerning the improvement of Beverly harbor, provided, however, that the expenditure of said appropriation be under the direction of this Board, and provided, further, that no expendi-

ture be made until Congress shall have made an appropriation for the improvement of Beverly harbor in accordance with the recommendations of the War Department. The recommendation of the Board is contained in a bill which has been filed.

The views of the mayor of Beverly with reference to the improvement of this harbor are expressed in the following letter: —

BEVERLY, MASS.

In reply to your request I would state that it is quite essential that we have a deeper and wider channel from the outer harbor to the wharves. The national government engineers have recommended the expenditure of $173,000 for this purpose, — $123,000 to be appropriated by the national government and $50,000 by the State government. I have no doubt but what the city government will be very glad to appropriate enough money to make a bulkhead near the edge of the proposed channel, thereby creating a large increase in wharfage area.

It seems to me that the work proposed in Beverly harbor by the engineers of the national government cannot help but bring splendid results, as Beverly is so favorably situated in regard to manufactures and railroads. It would mean much to the city and to the Commonwealth, I sincerely believe, to have this improvement made.

The representatives of our city appreciate very much the efforts made by your Board to secure better harbors for the cities where real business will come from the improvement, and which justifies the expenditure of money.

Yours very truly,

HERMAN A. MACDONALD,
Mayor.

No expenditures have been made by the Commonwealth, under the direction of this Board, between 1893 and 1913, inclusive, for the improvement of Beverly harbor.

BOSTON HARBOR.

Under the heading, "Harbor at Boston, Mass.," in the report of the Chief of Engineers, U. S. A., for 1913, appear the following statements concerning projects, appropriations, expenditures and work done by the federal government. They are printed with this report for convenient reference and comparison with those relating to other harbors in Massachusetts.

Reference is here made to the following annual reports of this Board: 1907, pages 4–60; 1910, pages 4–17; 1911, pages 4–42; 1912, pages 5, 6, containing much detailed information on the

subject of Boston harbor; a system of metropolitan docks in the city of Boston; the Commonwealth's flats at South Boston and East Boston; the Commonwealth Pier; anchorage basin in the upper harbor; improvements by the United States government and the Commonwealth of Massachusetts; statistics of the Port of Boston, including railroad lands and terminals, wharves, piers and docks, steamship lines; appointment of the Directors of the Port of Boston; powers and duties of the Board of Harbor and Land Commissioners; appropriations and expenditures, etc.

Projects of the Federal Government. The natural boundaries of Boston Harbor include all the expanse of tidewater lying within a line drawn from Point Allerton to Point Shirley, and extending from that line westward to the shores of the mainland. This comprises a surface area of about 30,000 acres, exclusive of the islands.

In its original condition the headlands and islands were without protection against the sea, which was extensively eroding them. Dangerous rocks obstructed the approach and entrance from Nantasket Roads to the lower main ship channel through the Narrows. That channel was 23 feet deep at mean low water, with a least width of 150 feet. The upper main ship channel from President Roads to Boston had a least depth of 18 feet at mean low water, with a least width of 100 feet. The channel from President Roads to Broad Sound in the ocean had a least depth of 29 feet at mean low water, with a least width of 200 feet.

The original project, adopted by the act of March 2, 1825, was "for the preservation of the islands in Boston Harbor, necessary to the security of that place," and until 1866 all expenditures, amounting to $546,526.10, appear to have been applied to that purpose in the building and repair of sea walls. The amount expended upon them since 1866 can not be accurately stated.

The project for the improvement of the harbor adopted by the act of March 2, 1867, was (as modified) to make the main ship channel from Nantasket Roads to Boston 23 feet deep at mean low water, 600 feet wide through the Narrows to President Roads, and 1,000 feet wide from President Roads to Boston.

To this project of improvement were added, from time to time, minor channels within or tributary to the harbor, since completed with allotments from the appropriation for Boston Harbor, known as Nantasket Beach Channel, Nix Mate Channel, Jeffries Point Channel, Chelsea Creek, Charles River, and Fort Point Channel.

Under the original project for sea walls and supplemental projects for the channels above named there has been expended for improvement and maintenance to June 30, 1913, $2,813,874.32, exclusive of all

expenditures upon the three existing projects (27-foot, 30-foot, and 35-foot channels), with which expenditure about 3.75 miles of sea walls have been built and maintained, protecting the most exposed headlands and islands, the subordinate channels described in the preceding paragraph (except Charles River) have been completed, and a channel was obtained 23 feet deep at mean low water from Nantasket Roads to Boston, with a least width of 625 feet in the narrows and 850 feet between President Roads and the city. From sales of property $265.46 has been derived.

The existing projects (other than for maintenance of the sea walls and the minor channels described above) are for improvement of the main channels, viz:

1. Adopted by the river and harbor act of July 13, 1892 (Annual Report of the Chief of Engineers, 1894, p. 554, with map): To widen the main ship channel, from Nantasket Roads to Boston, 8½ miles, to 1,000 feet, and to deepen it to 27 feet at mean low water, at an estimated cost of $1,250,000, subsequently increased to $1,488,751. Project completed.

2. Adopted by the river and harbor act of March 3, 1899 (H. Doc. No. 133, 55th Cong., 2d sess. with map; Annual Report of the Chief of Engineers, 1898, p. 886): To widen the Broad Sound Channel, 2 miles long from President Roads to the sea, to 1,200 feet, and to deepen it to 30 feet at mean low water, at an estimated cost of $455,000. Project completed.

3. Adopted by the river and harbor act of June 13, 1902 (H. Doc. No. 119, 56th Cong., 2d sess., with map; Annual Report of the Chief of Engineers, 1901, p. 1096): To provide channels 35 feet deep at mean low water, 1,200 feet wide from the navy yard at Charlestown and the Chelsea Bridge and Charles River Bridge to President Roads, 6 miles, and 1,500 feet wide from President Roads through Broad Sound to the ocean, 1½ miles, at an estimated cost of $7,994,000 in round numbers. This estimate differs from any made in the project quoted in the act as the basis of the appropriation, owing to the different widths of the channels adopted. (To avoid a large amount of rock excavation the 35-foot channel from President Roads to Broad Sound is in a different location from the 30-foot channel.) No modification has been made in any of the foregoing projects since their adoption.

References to Examination or Survey Reports and Maps or Plans (including Project Documents).

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Maps showing location of works of improvement:						
1875	–	–	–	–	1875[1] (Pt. 2)	404
1880	–	–	–	–	1880[1]	349
1883	–	–	–	–	1883[1]	454
Map showing location of works of preservation and improvement made and proposed by United States, from 1825–1888, and of improvements by State Harbor and Land Commissioners, 1866–1888	–	–	–	–	1888[1]	455
Upper harbor and Narrows, 1892 (map)[2]	–	–	–	–	1894[1]	554
Navy yard to entrance of main ship channel and from main ship channel in President Roads through Broad Sound, 1897[3]	House.	133[1]	Fifty-fifth.	Second.	1898[4]	886
Navy Yard and Chelsea Bridge and Charles River Bridge to President Roads and from President Roads through Broad Sound to the ocean, 1900[5]	House.	119[1]	Fifty-sixth.	Second.	1901[4] 1903[1]	1096 771
Headland in town of Hull, at entrance to Boston Harbor, 1882–3	Senate.	Ex. 74[1]	Forty-eighth.	First.	1884[4]	553
East Boston channel, 1892, 1894	House.	Ex. 55[4]	Fifty-second.	Second.	1893[4]	793
	House.	Ex. 58[1]	Fifty-third.	Third.	1895[4]	649
Allerton Point, with view to construction of sea wall to protect navigation, 1905	House.	140[4]	Fifty-ninth.	First.	–	–
Winthrop Head, with view to construction of sea wall to protect navigation, 1905	House.	144[4]	Fifty-ninth.	First.	–	–
South Bay, 1910	House.	272[4]	Sixty-second.	Second.	–	–
South channel of Mystic River, 1910	House.	272[4]	Sixty-second.	Second.	–	–
Winthrop Beach, with view to construction of sea wall, 1911	House.	258[4]	Sixty-second.	Second.	–	–

[1] Contains maps.
[2] Basis of 27-foot project adopted by Congress July 13, 1892.
[3] Basis of 30-foot project adopted by Congress Mar. 3, 1899.
[4] No maps.
[5] Basis of 35-foot project adopted by Congress June 13, 1902.

SUMMARY OF OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1913.

General improvement. — For drilling holes and setting dowels in repair of sea walls at Georges Island $1,646.94 was expended for maintenance. Outstanding liabilities, $150.

Thirty-five-foot channel. — Work was continued on removal of ledges. All the ledges included in the contract of July 5, 1911, were removed. Five ledges, containing 578 cubic yards, under contract of April 25, 1912, were also removed; and drilling, blasting, and dredging of blasted material were in progress on other ledges of this contract. Expenditure, $189,628.28, all for improvement. Outstanding liabilities, $50,756.24, not including $13,811.97 on account of contracts for dredging.

The entire 35-foot channel was swept to determine the extent of deterioration, and the U. S. hydraulic dredge *Atlantic*, temporarily loaned to this district from the second New York district, has been engaged since April 29, 1913, in removing shoals from the outer channel in Broad Sound. For this sweeping and dredging $39,755.61 was spent, chargeable to maintenance. Outstanding liabilities, $9,954.07.

Finns Ledge. — The survey of Finns Ledge was completed. Expenditure, $2,118.72, chargeable to improvement. Owing to the possibility of this ledge being required as a foundation for a lighthouse, the omission of the removal of the ledge for the present has been authorized.

Under the project of July 13, 1892, for 27-foot channel, the amount expended to June 30, 1913, was $1,474,106.29, of which $59,715.30 was for maintenance ($10 has been derived from sales).

Under the project of March 3, 1899, for 30-foot channel, to June 30, 1913, the amount expended was $455,000; $380,200 for improvement and $69,800 for maintenance.

To June 30, 1913, the amount expended on the 35-foot channel was $6,484,033.65; $6,444,278.04 for improvement and $39,755.61 for maintenance. From sales $129.22 has been derived.

With the total amount expended under the 27-foot project the upper and lower main ship channels from Boston to President Roads and from President Roads to the sea have been dredged to the width of 1,000 feet and depth of 27 feet at mean low water.

A survey of the improved channel in 1911 shows that no material deterioration had occurred. The maximum draft that can be carried at mean low water, June 30, 1913, over the shoalest part is 27 feet.

Under the 30-foot project a channel has been obtained 1,200 feet wide and 30 feet deep at mean low water from President Roads to Broad Sound.

A survey of the improved channel in 1911 shows that no material deterioration had occurred. The maximum draft that can be carried at mean low water, June 30, 1913, over the shoalest part is 30 feet.

Under the 35-foot project of June 13, 1902, a channel of the full pro-

jected depth and width from the navy yard, Charles River Bridge, and Chelsea Bridge to President Roads, and from President Roads through Broad Sound to the ocean has been dredged, but the channel is still obstructed by ledges in the inner harbor on the northerly side in the vicinity of Governors and Castle Islands, where the width is restricted to from 500 to 700 feet, with a least depth of about 27 feet, and by a ledge in the middle of the channel at the confluence of Mystic River and Chelsea Creek, covering an area 300 feet long and 200 feet wide, on which the least depth is about 25 feet; shoal areas in the outer and inner channels reduce the available depth to 32 feet. All the ledges and shoals are now being removed.

The work accomplished to the end of the fiscal year in the upper main ship channel was the dredging of 16,647,702.5 cubic yards of mud, sand, gravel, and clay, 23.642 cubic yards of bowlders, and the excavation of 63,618.09 cubic yards of ledge; and in Broad Sound Channel the dredging of 4,916,846 cubic yards of mud, sand, gravel, clay, hardpan, and cobblestones, 349.993 cubic yards of bowlders, and the excavation of one ledge containing 8 cubic yards. The total amount of material dredged is 21,564,922.135 cubic yards and of rock excavated is 63,626.09 cubic yards, which completes all the dredging and about 45 per cent of all the rock excavation required under the project. The yardage expressed refers to scow measurement except for rock excavation, which is place measurement.

The mean range of tide is 9.5 feet at Boston Light and 9.6 feet in the upper harbor.

The foreign exports and imports for the port of Boston during the calendar year ending December 31, 1912, amounted in value to $216,310,889, being an increase of $149,624,368 over the valuation in 1867, when the systematic improvement of the channels was begun.

As to the effect of the improvement on freight rates, the general manager of the principal foreign steamship lines entering this port states that about 30 years ago steamers were employed with a loaded draft of 20 feet to 24 feet; 22 or 23 years ago, of 25 to 26 feet; 14 years ago, 27 or 28 feet; 10 years ago, 28 feet 9 inches; later, 31 feet; and recently one of 33 feet 10½ inches. He states, generally —

> that freight rates, caused by the larger class of steamers being used, are about 50 per cent less than they were some 15 or 20 years ago, when very much smaller steamers were engaged in the trade.

The appropriation recommended for the 35-foot channel will be applied to maintenance of the channel by removal of shoals in the inner harbor and Broad Sound.

The River and Harbor Act approved March 4, 1913, provided for a preliminary examination and survey of Boston Harbor, with a view to securing increased width and depth of channel from Mystic River to President Roads.

Tributary channels. — (*a*) *Chelsea Creek.* — Chelsea Creek begins at a tidal dam between the city of Chelsea and the town of Revere, flows in a generally southerly direction for about 3 miles, and empties into Boston Harbor near the mouth of Mystic River.

In its original condition the stream had a channel of practicable width extending 11,000 feet from its confluence with Mystic River in Boston Harbor and 18 feet deep at mean high water, except on a bar about 2,000 feet below its head, upon which the depth was 17 feet. In the 3,300 feet from the head of the 18-foot channel to the head of navigation the depth gradually shoaled to 13 feet at mean high water.

The improvement is embraced in two projects.

One project, adopted by the act of June 3, 1896 (H. Ex. Doc. No. 162, 53d Cong., 3d sess., with map; Annual Report of the Chief of Engineers, 1895, p. 648), is to make the channel about 5,500 feet in length next below the head of navigation, 150 feet wide, and 18 feet deep at mean high water, at an estimated cost of $65,000. The lower end of this project is about two miles above the mouth of the river. No modification has been made in this project since its adoption.

No operations were in progress during the fiscal year.

The amount expended under this project to June 30, 1913, was $73,-071.49, all for improvement, with which the channel was completed in 1907 in accordance with the project.

The head of navigation is at the bridge of the Boston & Maine Railroad, to which point the stream is navigable in fact 650 feet below the tidal dam at its source, and 2.7 miles above its confluence with Mystic River.

June 30, 1913, the maximum draft that can be carried at mean high water over the shoalest part of the improved channel is 18 feet. The mean range of tide is 9.6 feet.

The commerce benefited by this improvement, consisting chiefly of coal, amounted in 1909 to 19,019 short tons; in 1910 to 5,764 short tons; in 1911 to 13,778 short tons; and in 1912 to 14,053 short tons, valued at $46,335.95.

No maintenance work being required, no estimate of funds is submitted for this section of the river.

The other project was adopted by the act of July 25, 1912, (H. Doc. No. 272, 62d Cong., 2d sess., with map), and is to dredge a channel 150 feet wide and 25 feet deep at mean low water from the Meridian Street Bridge, at the head of the 35-foot channel in Boston Harbor, to the old East Boston (Chelsea Street) Bridge, a distance of about seven-eighths of a mile, at an estimated cost of $85,000, appropriated in full by that act, with a proviso that the 24-inch water main of the metropolitan water system, which crosses the stream about 800 feet above the Meridian Street Bridge, be lowered without expense to the United States.

No modification has been made in the existing project since its adoption.

No operations were in progress during the fiscal year and no expenditures made.

No work has been done under the project. By act of the Massachusetts Legislature, approved June 6, 1913, $75,000 was appropriated for lowering the water main, but work has not yet been begun.

The commerce in the part of the river embraced in this project amounted to 417,797 short tons in 1910; to 356,481 short tons in 1911; and to 394,805 short tons in 1912, valued at $6,906,779.30.

The act of July 25, 1912, adopting the project, appropriated the entire amount of the estimated cost of the improvement. Therefore no estimate of additional funds is submitted.

References to Examination or Survey Reports and Maps or Plans (including Project Documents).

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Chelsea River from Grand Junction R.R. Bridge to Boston & Maine R.R. Bridge, 1892 and 1894[1]	House.	Ex. 40[2]	Fifty-second.	Second.	1893[2]	790
	House.	Ex. 162[2]	Fifty-third.	Third.	1895[2]	648
Chelsea Creek between the Meridian Street Bridge and the old East Boston Bridge, 1911[4]	House.	272[2]	Sixty-second.	Second.	–	–

[1] Basis of project adopted by Congress June 3, 1896.
[2] No maps.
[3] Contains maps.
[4] Basis of project adopted by Congress July 25, 1912.

(*b*) *Fort Point Channel.* — This channel is situated between the eastern shore of Boston proper on the one side and the reclaimed and improved South Boston flats on the other side; is about 1¼ miles in length and connects the tidal basin of the South Bay, which covers an area of about 250 acres, with Boston upper harbor. In its original condition the mid-channel depth was 12 feet at its mouth and 16 feet thence to the Federal Street Bridge, excepting at the draw in the Congress Street Bridge, where it was 14.5 feet at mean low water.

The original project, adopted by the act of August 5, 1886 (H. Ex. Doc. No. 206, 48th Cong., 2d sess., without map; Annual Report of the Chief of Engineers, 1885, p. 543), which is also the existing project, is to dredge a channel 175 feet wide and 23 feet deep at mean low water from the entrance about 4,190 feet to near Federal Street Bridge, at an estimated cost of $100,000, reduced in 1887 to $78,750. No modification has been made in the existing project since its adoption.

References to Examination or Survey Reports and Maps or Plans (including Project Documents).

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Fort Point Channel and the channel leading to wharves of New York and New England R.R., 1882–83 . .	Senate.	Ex. 74[1]	Forty-eighth.	First.	1884[1]	588
Fort Point Channel, 1884[2] .	House.	Ex. 206[1]	Forty-eighth.	Second.	1885[1]	543

No work was done and none required in maintenance of improvement during the fiscal year.

The total cost to the United States to June 30, 1913, was $75,606.23, including $9,219.10 for maintenance.

The improvement was completed in 1909.

The maximum draft that can be carried June 30, 1913, at mean low water over the shoalest part of the improved channel is 23 feet. The mean range of tide is 9.6 feet.

The head of navigation is the southern extremity of South Bay, at Massachusetts Avenue, Boston, Mass., to which point, about 2 miles from the entrance to the channel in Boston Harbor, the channel is navigable in fact.

The commerce benefited by this improvement consists of coal, sugar, building materials, and miscellaneous merchandise, which amounted in the calendar year 1910 to 1,423,456 short tons, in 1911 to 1,507,621 short tons, and in 1912 to 1,101,374 short tons[3], valued at over $16,500,000.

Project for General Improvement.

July 1, 1912, balance unexpended	$8,769 37
Amount appropriated by river and harbor act approved Mar. 4, 1913 .	25,000 00
	$33,769 37
June 30, 1913, amount expended during fiscal year for maintenance of improvement	1,646 94
July 1, 1913, balance unexpended	$32,122 43
July 1, 1913, outstanding liabilities	150 00
July 1, 1913, balance available	$31,972 43

[1] No maps.

[2] Basis of project adopted by Congress Aug. 5, 1886.

[3] Incomplete figures.

PROJECT OF 1892 FOR 27-FOOT CHANNEL.

July 1, 1912, balance unexpended		$31,500 00
July 1, 1913, balance unexpended		31,500 00

PROJECT OF 1902 FOR 35-FOOT CHANNEL.

July 1, 1912, balance unexpended		$847,591 67
Amount appropriated by sundry civil act approved Aug. 24, 1912		25,000 00
Amount appropriated by sundry civil act approved June 23, 1913		150,000 00
Receipts from sales		6 51
		$1,022,598 18
June 30, 1913, amount expended during fiscal year:		
For works of improvement	$191,747 00	
For maintenance of improvement	39,755 61	
		231,502 61
July 1, 1913, balance unexpended		$791,095 57
July 1, 1913, outstanding liabilities		74,522 28
July 1, 1913, balance available		$716,573 29
July 1, 1913, amount covered by uncompleted contracts		$614,901 45
Amount of continuing contract authorization, act of Mar. 2, 1907		$3,894,000 00
Amount appropriated under such authorization		3,175,000 00
Amount yet to be appropriated		$719,000 00
Amount (estimated) required to be appropriated for completion of existing project		[1] $719,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1915, for maintenance of improvement		$200,000 00

CHELSEA CREEK (BOSTON HARBOR) PROJECT.

Amount appropriated by river and harbor act approved July 25, 1912	$85,000 00
July 1, 1913, balance unexpended	85,000 00

CONSOLIDATED.

July 1, 1912, balance unexpended		$40,861 04
Amount appropriated by river and harbor act approved Mar. 4, 1913		75,000 00
		$115,861 04
June 30, 1913, amount expended during fiscal year:		
For works of improvement	$191,747 00	
For maintenance of improvement	41,402 55	
		233,149 55
July 1, 1913, balance unexpended		$939,718 00
July 1, 1913, outstanding liabilities		74,672 28
July 1, 1913, balance available		$748,545 72

[1] Exclusive of the balance unexpended July 1, 1913.

July 1, 1913, amount covered by uncompleted contracts . .	$614,901 45
Amount of continuing contract authorization, act of Mar. 2, 1907 .	$3,894,000 00
Amount appropriated under such authorization	3,175,000 00
Amount yet to be appropriated	$719,000 00
Amount (estimated) required to be appropriated for completion of existing project	[1] $719,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1915, for maintenance of improvement . . .	[1] $200,000 00

Commercial Statistics.

The following statement concerning the foreign trade at the port of Boston is compiled from statistics and records of the Boston Chamber of Commerce and of the collector of the port. It comprises only imports and exports and does not include domestic, coastwise, and local traffic. Vessels engaged in the coastwise trade, unless they have in their cargoes bonded merchandise to the value of $350 or more, are not required by law to take out clearance papers, and no statistics of their carrying trade are accessible.

Foreign Trade.

Comparative Statement of Quantity and Value of Exports and Imports and of Customs Collected.

Year.	Exports.		Imports.		Total.		Customs collected.
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	
	Short tons.		*Short tons.*		*Short tons.*		
1867 .	-	$19,317,841	-	$47,288,747	-	$66,606,588	$16,207,198 54
1903 .	-	86,429,988	-	82,762,828	-	169,192,816	22,360,096 75
1904 .	-	87,866,428	-	86,268,648	-	174,135,076	23,102,087 97
1905 .	1,294,815	93,797,887	974,712	106,065,998	2,269,527	199,863,885	26,208,144 20
1906 .	1,365,786	99,370,016	1,229,623	110,333,970	2,595,409	209,703,986	27,459,534 50
1907 .	1,337,019	104,610,908	1,107,764	123,414,168	2,444,783	228,025,076	26,238,897 33
1908 .	1,064,445	84,353,536	979,976	89,121,981	2,044,421	173,475,517	22,562,253 32
1909 .	823,519	72,936,869	1,165,349	127,031,679	1,988,868	199,968,548	30,954,305 85
1910 .	765,500	69,482,859	1,256,892	121,448,107	2,022,392	190,930,966	27,114,516 11
1911 .	774,088	73,913,325	816,186	115,662,053	1,590,274	189,575,378	23,534,865 31
1912 .	659,117	65,692,646	1,330,871	150,618,243	1,989,988	216,310,889	27,232,956 08

The leading articles of export and import at the port of Boston for the calendar years 1911 and 1912, with the value and quantity of each, were as follows:

[1] Exclusive of the balance unexpended July 1, 1913.

Exports.

	1911.		1912.	
	Value.	Quantity.	Value.	Quantity.
		Short tons.		*Short tons.*
Meat and dairy products	$15,705,530	81,422	$12,221,130	66,638
Breadstuffs	8,104,516	381,345	2,671,511	139,884
Leather and manufactures	12,708,547	23,943	12,906,996	23,885
Animals	4,918,281	36,568	677,334	4,571
Cotton and manufactures	10,576,830	32,649	15,607,665	54,817
Steel billets, rails, and other iron and steel manufactures.	6,424,812	5,623	6,032,278	159,446
Agricultural implements	339,898	2,416	316,999	2,427
Rum	1,594,763	4,735	1,693,937	5,281
Wood and manufactures	1,853,355	69,035	1,516,695	55,307
Paper and manufactures	1,741,498	15,757	1,553,713	12,911
Rubber manufactures	800,871	2,190	681,463	1,808
Apples	1,334,214	36,606	1,471,995	48,457
Miscellaneous	7,810,210	81,799[1]	8,340,930	83,685[1]
Total	$73,913,325	774,088	$65,692,646	659,117

Imports.

	1911.		1912.	
	Value.	Quantity.	Value.	Quantity.
		Short tons.		*Short tons.*
Wool	$12,161,433	33,879	$22,485,603	44,275
Fibers, vegetable grasses, and manufactures.	13,698,313	31,429	18,110,357	143,438
Hides and skins	17,503,395	36,320	27,128,529	65,160
Sugar	8,519,150	196,480	10,662,862	217,930
Cotton and manufactures	19,549,494	41,284	20,319,326	36,924
Chemicals, drugs and dyes	5,325,112	55,827	5,419,385	61,421
Leather and manufactures	2,035,497	1,167	3,315,700	1,404
Iron and steel and manufactures	4,060,486	53,544	3,186,125	42,836
Fruits and nuts	2,766,694	95,218	2,722,502	95,677
Fish	2,142,430	14,113	1,936,286	11,727
China and earthenware	655,395	1,723	717,945	1,796
Wood and manufactures	3,597,468	92,416	4,029,594	347,116
India rubber and manufactures	1,255,805	4,778	1,816,396	6,969
Miscellaneous	22,391,381	158,008[1]	28,767,633	254,198[1]
Total	$115,662,053	816,186	$150,618,243	1,330,871

[1] Approximate.

Passengers arriving from and departing for Foreign Countries by Trans-Atlantic Lines.

Years.	Cabin passengers.			Steerage passengers.			Total.
	Inward.	Outward.	Total.	Inward.	Outward.	Total.	
1902	12,283	8,584	20,867	52,167	13,815	65,982	86,849
1903	15,511	10,544	26,055	60,143	15,547	75,690	101,745
1904	13,604	10,995	24,599	63,551	13,604	77,155	101,754
1905	15,092	10,758	25,850	57,184	18,672	75,856	101,706
1906	18,852	14,686	33,538	68,014	22,407	90,421	123,959
1907	19,479	12,639	32,118	71,813	27,163	98,976	131,094
1908	16,296	9,946	26,242	31,654	31,851	63,505	89,747
1909	17,102	9,252	26,354	47,198	17,369	64,567	90,921
1910	20,414	10,849	31,263	54,676	17,042	71,718	102,981
1911	22,148	10,430	32,578	38,952	24,397	62,349	95,927
1912	22,955	12,722	35,677	47,269	21,942	69,211	104,888

The steamer *Arabic*, of 15,801 tons and draft of 33 feet 10½ inches, of the White Star Line; the steamers *Franconia* and *Laconia*, of the Cunard Line, each of 18,000 tons and draft of 29¾ feet; and the steamers *Cleveland* and *Cincinnati*, of the Hamburg-American Line, each of 18,000 tons and draft of 32 feet 8½ inches, are the largest of the trans-Atlantic liners sailing from this port.

Foreign Entrances and Clearances, 1912.

Class.	Entered from foreign ports.		Cleared for foreign ports.		Total.	
	Number.	*Tonnage.*	*Number.*	*Tonnage.*	*Number.*	*Tonnage.*
American steam vessels .	89	171,825	70	129,181	159	301,006
American sailing vessels .	77	20,677	100	34,095	177	54,772
Foreign steam vessels .	996	2,815,465	655	1,641,575	1,651	4,457,040
Foreign sailing vessels .	277	53,766	302	63,196	579	116,962
Total . . .	1,439	3,061,733	1,127	1,868,047	2,566	4,929,780

Domestic and Coastwise Arrivals and Departures.

Class.	Arrivals.		Departures.[1]		Total.	
	Number.	Gross tonnage.	Number.	Gross tonnage.	Number.	Gross tonnage.
Steamers	2,909	7,708,087	2,909	7,708,087	5,818	15,416,174
Sailing vessels	1,317	822,201	1,317	822,201	2,634	1,644,402
Tugs	2,382	690,379	2,382	690,379	4,764	1,380,758
Barges	3,379	3,037,363	3,379	3,037,363	6,758	6,074,726
Total	9,987	12,258,030	9,987	12,258,030	19,974	24,516,060

[1] Approximate.

Receipts of Coal.

[Long tons.]

Year.	By sea.			Total by rail.	Total by all routes.
	Anthracite.	Bituminous.	Total.		
1904	1,961,785	2,948,268	4,910,053	158,599	5,068,652
1905	1,941,478	3,365,657	5,307,135	77,024	5,384,159
1906	1,630,674	3,430,665	5,061,339	116,256	5,177,595
1907	2,016,252	3,741,709	5,757,961	126,963	5,884,924
1908	1,733,112	3,611,271	5,344,383	105,656	5,450,039
1909	1,668,126	3,621,720	5,289,846	140,121	5,429,967
1910	1,760,883	4,250,815	6,011,698	218,324	6,230,022
1911	1,881,767	4,365,606	6,247,373	170,658	6,418,031
1912	1,554,156	4,784,646	6,338,802	239,215	6,578,017

SUMMARY.

Vessel Movement.

YEAR.	FOREIGN TRADE.		DOMESTIC TRADE.		TOTAL.	
	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.
1902 . . .	3,345	4,698,216	17,032	14,583,862	20,377	19,282,078
1903 . . .	2,973	5,119,468	18,632	16,839,578	21,605	21,959,046
1904 . . .	2,688	4,800,868	17,598	16,820,728	20,286	21,621,596
1905 . . .	2,904	4,980,410	18,132	17,874,916	21,036	22,855,326
1906 . . .	2,966	5,395,119	17,286	18,549,230	20,252	23,944,349
1907 . . .	2,808	5,148,434	19,232	20,522,948	22,040	25,671,382
1908 . . .	2,479	4,815,931	18,230	21,087,052	20,709	25,902,983
1909 . . .	2,551	4,545,773	19,362	24,478,668	21,913	29,024,441
1910 . . .	2,505	4,659,751	19,982	23,806,748	22,487	28,466,499
1911 . . .	2,488	4,799,575	20,480	23,811,774	22,968	28,611,349
1912 . . .	2,566	4,929,780	19,974	24,516,060	22,540	29,445,840

TRIBUTARY CHANNELS, BOSTON HARBOR.

Chelsea Creek (Upper 1 Mile of River).

ARTICLES.	1908.	1909.	1910.	1911.
	Short tons.	*Short tons.*	*Short tons.*	*Short tons.*
Coal	1,176	10,673	4,764	12,578
Sand	–	400	1,000	1,200
Chalk	–	7,946	–	–
Total	1,176	19,019	5,764	13,778

Vessel Classification, 1912.

CLASS.	American.	Total net registered tonnage.
Registered:		
Steamers	5	602
Sailing vessels	9	5,686
Barges	3	1,783
Total	17	8,071

Freight Traffic.

Articles.	Amount (customary units).	Amount in short tons.	Valuation.
Coal	12,894 short tons	12,894	$45,582 60
Sand	1,159 short tons	1,159	753 35
Total		14,053	$46,335 95

Chelsea Creek between Meridian Street Bridge and Chelsea Street Bridge (includes also Commerce of Upper 1 Mile of River).

Articles.	1910.	1911.
	Short tons.	*Short tons.*
Coal	141,241	44,773
Oil	221,594	281,693
Lumber	2,168	4,212
Stone	5,100	100
Iron	1,347	50
Chalk	9,706	9,329
Cement	15	–
Sand and gravel	27,592	5,448
Brick	100	2,500
Pipe	–	596
Piles	–	250
Edgestone	–	75
Tar	–	7,255
Miscellaneous	8,934	200
Total	417,797	356,481

Vessel Classification, 1912.

Class.	American.	Foreign.	Total.	Total net registered tonnage.
Registered:				
Steamers	61	–	61	29,831
Sailing vessels	69	5	74	145,881
Barges	191	–	191	60,572
Unregistered, unrigged	325	–	325	–
Total	646	5	651	236,284

Freight Traffic.

Articles.	Amount (customary units).	Amount in short tons.	Valuation.
Coal	46,553 short tons	46,553	$192,181 33
Chalk	11,469 short tons	11,469	41,288 00
Brick	50 short tons	50	1,391 00
	363,500, number	817	3,635 00
Pipe	581 short tons	581	11,001 00
Lumber	1,602,093 feet	2,353	29,865 93
	3,200 short tons	3,200	41,488 00
Piles	5,000, number	2,500	50,000 00
Machinery and equipment	545 short tons	545	25,000 00
Sand	3,740 short tons	3,740	5,039 45
Tar	6,013 short tons	6,013	48,075 00
Oil	2,080,560 barrels	312,081	6,414,298 04
	2,000 short tons	2,000	32,000 00
Cement	100 barrels	20	150 00
Gravel	1,943 short tons	1,943	1,726 55
Iron	100 short tons	100	5,000 00
Wood	100 cords	250	500 00
Stone	500 short tons	500	500 00
Steel	50 short tons	50	3,000 00
Miscellaneous	40 short tons	40	640 00
Total		394,805	$6,906,779 30

Fort Point Channel.

Articles.	1908.	1909.	1910.	1911.
	Short tons.	*Short tons.*	*Short tons.*	*Short tons.*
Coal	1,007,694	874,607	998,690	1,052,625
Lumber	28,417	95,990	160,233	64,711
Brick	8,055	11,062	8,645	7,069
Stone	4,468	14,761	6,800	4,780
Sugar	145,000	131,130	157,000	164,000
Cotton	–	–	150	–
Wool	–	2,500	–	–
Steel	–	649	450	300
Molasses	–	16,500	14,963	9,000
Iron	3,321	5,042	8,558	6,103
Oil	–	500	140	200
Salt	2,500	800	900	300

Fort Point Channel. — Concluded.

Articles.	1908.	1909.	1910.	1911.
	Short tons.	*Short tons.*	*Short tons.*	*Short tons.*
Wood	4,805	2,631	1,014	6,766
Lime	5,294	11,585	9,389	8,348
Cement	11,726	10,152	4,183	1,000
Sand	12,591	20,928	24,597	11,283
Gravel	5,552	8,761	10,780	6,267
Plaster	445	2,979	11,587	7,491
Grindstones	630	1,506	1,318	1,404
Pulp wood	–	–	150	–
Raw clay	–	–	585	65
Flagstone	–	–	330	950
Edgestone	–	–	2,068	4,327
Fire brick	–	–	294	–
Fire clay	–	–	53	–
Barrels	–	–	–	300
Paving blocks	–	–	–	795
Laths	–	–	–	1,096
Pipe	–	–	–	1,156
Miscellaneous	10,892	7,395	669	147,285
Total	1,251,390	1,219,478	1,423,546	1,507,621

Commercial Statistics for 1912.

Vessel Classification.

Class.	American.	Foreign.	Total.	Total net registered tonnage.
Registered:				
Steamers	64	31	95	135,606
Sailing vessels	719	85	804	386,095
Barges	115	–	115	46,800
Miscellaneous	5	–	5	1,500
Sailing vessels	20	25	45	–[1]
Barges	2	–	2	–[1]
Unregistered:				
Steamers	–	1	1	–
Sailing vessels	54	5	59	–
Unrigged	305	–	305	–
Total	1,284	147	1,431	570,001

[1] Not ascertainable.

Freight Traffic.

Articles.	Amount (customary units).	Amount in short tons.	Valuation.
Coal	723,368 short tons	723,368	$3,235,709 75
Lumber	51,978,967 feet	77,407	1,174,751 73
Stone	4,111 short tons	4,111	34,888 25
Curb and flagging	40,912 feet	3,614	30,021 39
	258 pieces		
Paving blocks	3,871 number	45	243 87
Paper	18,000 short tons	18,000	900,000 00
Barrels	10,081 number	100	10,000 00
Cement	820 short tons	820	6,150 00
Plaster boards	75,000 number	488	7,500 00
Pipe	425 short tons	425	7,837 00
Salt	250 short tons	250	700 00
Oil	4,000 barrels	400	25,000 00
	40 short tons	40	240 00
Gravel	6,726 short tons	6,726	7,321 80
Shingles	248,000 number	34	750 00
Laths	9,168,400 number	2,550	35,535 64
Molasses	26,161 barrels	17,180	291,000 00
	1,604,093 gallons		
Iron	5,384 short tons	5,384	89,010 56
Wood	1,137 cords	2,526	7,938 50
	2,261 short tons	2,261	13,249 11
Brick	3,256,000 number	7,327	29,304 00
	6,197 short tons	6,197	21,513 72
Plaster	18,881 barrels	2,901	30,738 00
	164,812 bags	9,133	68,497 00
Lime	52,519 barrels	5,467	47,046 00
	6,858 short tons	6,858	60,737 78
Sugar	171,000 short tons	171,000	10,493,000 00
	200 bags	33	2,640 00
Coke breeze	3,116 short tons	3,116	6,264 00
Sand	19,699 short tons	19,699	15,995 58
Logs	420,000 number	1,518	30,000 00
Total		1,098,978	$16,683,583 68
Paving blocks		2,396	–[1]
		1,101,374[2]	–

[1] Not ascertainable. [2] Incomplete; statistics from two firms unobtainable.

APPROPRIATIONS.

Mar. 2, 1825	$52,972 56		July 5, 1884	$5,000 00	
Mar. 19, 1828	2,000 00		Aug. 5, 1886	56,250 00	
May 23, 1828	87,000 00		Aug. 11, 1888	125,000 00	
Mar. 2, 1829	7,310 54		Sept. 19, 1890	145,000 00	
Mar. 2, 1831	5,000 00		July 13, 1892	300,000 00	
Mar. 2, 1831	12,390 00		Aug. 18, 1894	200,000 00	
Feb. 24, 1832	9,000 00		June 3, 1896	70,000 00	
July 3, 1832	60,000 00		June 4, 1897	400,000 00	
July 4, 1836	15,000 00		July 1, 1898	250,000 00	
July 7, 1838	7,353 00		Mar. 3, 1899	75,000 00	
Mar. 3, 1841	1,000 00		Mar. 3, 1899	163,751 00	
Mar. 3, 1841	1,500 00		June 6, 1900	317,000 00	
Aug. 31, 1842	2,000 00		Mar. 3, 1901	133,000 00	
Mar. 3, 1843	16,000 00		June 13, 1902	100,000 00	
July 20, 1848	40,000 00		June 13, 1902[2]	600,000 00	
Aug. 30, 1852	30,000 00		June 28, 1902	175,000 00	
July 2, 1864	40,000 00		Mar. 3, 1903[2]	150,000 00	
July 2, 1864	10,000 00		Apr. 28, 1904[2]	350,000 00	
Feb. 28, 1865	3,000 00		Mar. 3, 1905[2]	970,000 00	
Feb. 28, 1865	20,000 00		Mar. 3, 1905	100,000 00	
June 12, 1866	50,000 00		June 30, 1906[2]	600,000 00	
June 12, 1866	75,000 00		Mar. 2, 1907	50,000 00	
Mar. 2, 1867	375,000 00		Mar. 2, 1907[2]	500,000 00	
July 25, 1868[1]	43,000 00		Mar. 4, 1907[2]	930,000 00	
Apr. 10, 1869[1]	82,170 00		Mar. 4, 1909[2]	1,200,000 00	
Apr. 10, 1869[1]	24,750 00		June 25, 1910[2]	900,000 00	
July 11, 1870	100,000 00		June 25, 1910	25,000 00	
Mar. 3, 1871	100,000 00		Mar. 4, 1911[2]	900,000 00	
June 10, 1872	75,000 00		July 25, 1912[4]	85,000 00	
Mar. 3, 1873	150,000 00		Aug. 24, 1912[2]	25,000 00	
June 23, 1874	100,000 00		Mar. 4, 1913	25,000 00	
Mar. 3, 1875[2]	90,000 00		June 23, 1913[2]	150,000 00	
Aug. 14, 1876	50,000 00				
June 18, 1878	55,000 00		Total of appropriations		$12,187,947 10
Mar. 3, 1879	50,000 00		Receipts from sales		404 68
June 14, 1880	75,000 00				
Mar. 3, 1881	100,000 00				$12,188,351 78
Aug. 2, 1882	96,500 00				

NOTE. — From 1832 to 1872 $1,619.52 was carried to surplus fund; June 30, 1909, $20,000 was carried to surplus fund.

[1] Allotment. Date of allotments unknown.
[2] Excluding $10,000 allotted to Hingham Harbor.
[3] For 35-foot channels.
[4] Chelsea Creek.

STATEMENT[1] OF FEDERAL APPROPRIATIONS AND EXPENDITURES FOR IMPROVEMENT OF RIVERS AND HARBORS IN THE STATE OF MASSACHUSETTS FROM THE ESTABLISHMENT OF THE GOVERNMENT TO THE CLOSE OF THE FISCAL YEAR ENDING JUNE 30, 1913.

LOCALITY.	Expenditures.	Appropriations.
Newburyport Harbor	$441,320 18	$473,500 00
Merrimac River	393,001 57	405,266 72
Sandy Bay, Cape Ann, harbor of refuge	1,767,174 15	1,950,000 00
Gloucester Harbor	517,582 18	542,083 00
Beverly Harbor	36,172 10	48,500 00
Salem Harbor	63,868·66	65,000 00
Lynn Harbor	371,897 11	476,837 00
Mystic River (upper portion)	28,994 88	38,994 88
Mystic River (below mouth Island End River)	212,652 82	283,005 57
Malden River	69,700 00	150,000 00
Boston Harbor	11,227,014 26	12,187,947 10
Dorchester Bay and Neponset River	94,584 55	125,233 00
Weymouth Fore River	173,250 00	240,250 00
Weymouth Back River	26,000 00	27,000 00
Hingham Harbor	38,316 58	39,000 00
Plymouth Harbor	302,989 92	393,081 90
Provincetown Harbor	306,896 41	365,828 44
Pollock Rip Shoals, Nantucket Sound	81,753 37	250,000 00
Hyannis Harbor	197,544 01	221,267 07
Nantucket Harbor of Refuge	517,538 75	576,373 50
Woods Hole Channel	322,220 82	343,599 92
New Bedford and Fairhaven Harbors	679,769 24	754,310 00
Taunton River	200,243 68	213,000 00
Fall River Harbor	317,814 63	368,912 00
Totals	$18,388,299 87	$20,538,990 10

[1] Furnished by the Chief of Engineers, U. S. A.

The above data, compiled from the Annual Report of the Chief of Engineers for the fiscal year ending June 30, 1913, represent works at present under improvement.

Locality.	Expenditures.	Appropriations.
Bass River	$20,150 34	$20,150 41
Bussards Bay Harbor	2,500 00	2,500 00
Canapitset Channel	5,312 54	9,800 00
Chatham Harbor	15,971 36	13,732 79
Cohasset Harbor	10,000 00	10,000 00
Duxbury Harbor	32,000 00	37,000 00
East Dennis Breakwater	7 57	1,500 00
Edgartown Harbor	25,000 00	25,000 00[1]
Essex River	30,000 00	30,000 00
Ipswich River	5,617 91	7,500 00
Kingston Harbor	8,940 09	10,000 00
Manchester Harbor	23,985 57	24,300 00
Marblehead Harbor	833 42	1,500 00
Marthas Vineyard Harbor	5,000 00	5,000 00[1]
Powow River	50,940 72	51,000 00
Rockport Harbor	22,000 00	—[2]
Scituate Harbor	104,590 98	104,680 00
Town River	18,000 00	18,000 00
Vineyard Haven Harbor	55,387 35	60,000 00
Wareham Harbor	95,997 30	96,236 00
Wellfleet Harbor	11,365 57	16,000 00
Westport Harbor	3,000 00	3,000 00
Weymouth and Town Rivers	82,327 41	83,000 00
Winthrop Harbor	9,000 00	9,000 00
Totals	$637,928 13	$638,899 20

[1] Same locality.

[2] See Sandy Bay, Cape Ann, harbor of refuge.

Note. — Data in the preceding table taken from figures furnished by Treasury Department, and represent improvements upon which no work is now in progress.

Recapitulation.

Total of first table	$18,388,299 87	$20,538,990 10
Total of second table	637,928 13	638,899 20
Grand total	$19,026,228 00	$21,177,889 30

STATEMENT OF EXPENDITURES FOR BOSTON HARBOR AND ITS TRIBUTARIES TO JUNE 30, 1913.

LOCALITY.	Expenditures.	Appropriations.
Boston Harbor proper	$11,227,014 26	$12,187,947 10
Mystic River (below mouth Island End River)	212,652 82	283,005 57
Mystic River (upper portion)	28,994 88	38,994 88
Malden River	69,700 00	150,000 00
Chelsea Creek	-[1]	-[1]
Fort Point Channel	-[1]	-[1]
Totals	$11,538,361 96	$12,659,947 55

[1] These amounts included in item for Boston Harbor proper (above).

NOTE. — The tributaries given above are those now under improvement and do not include tributaries heretofore improved, which may be taken from preceding table of old works.

The total expenditures by the State for the improvement of Boston main harbor, including the Commonwealth's flats at South Boston and East Boston, and the Commonwealth Pier, from 1870 to 1911, inclusive, were $5,406,138.79.

The expenditures by the State under the Directors of the Port of Boston, to Dec. 1, 1913, are stated to be $2,703,395.23, making the total expenditure for Boston harbor to Dec. 1, 1913, approximately $8,109,500.

BUCKS CREEK, CHATHAM.

Bucks Creek is the outlet of Taylors Pond, in the southwesterly part of the town of Chatham, and is used as a harbor by a fleet of fishing boats.

The work of improvement was commenced in 1904, and a pile and timber jetty built on the westerly side of the mouth of the creek.

In 1910 and 1911 two stone jetties were built; the channel between the same was excavated to the level of mean low water, a dike across the existing channel built, and the banks of the excavated channel protected by stone riprap.

A petition of Alonzo F. Cahoon, and others, under chapter 481 of the Acts of 1909 and chapter 642 of the Acts of 1912, for further improvement was presented Jan. 22, 1913.

Contribution: —
By town of Chatham, and others, 1910, ... $1,000

Total amount expended to Dec. 1, 1913, $11,633.86.

Buzzards Bay, Falmouth.

On Feb. 14, 1912, a petition of the estate of John C. Haynes, and others, under the provisions of chapter 481 of the Acts of 1909, for a harbor on Buzzards Bay between Gunning Point and Hamlin Point in the town of Falmouth, was presented, and a hearing held on Feb. 28, 1912. The particular project discussed at the hearing, namely, the excavating an entrance from Buzzards Bay to a small pond, was, after examination, found inexpedient.

A survey, map and further examination of this locality has been made during the year, and two estimates of cost prepared, providing for a harbor for small boats by the construction of a breakwater in this bay projecting from the shore line, eliminating any connection between the pond and bay as originally suggested by the petitioners.

If, upon further examination and consideration, it should be deemed advisable to provide a harbor of approximately 2 acres in extent, it would be necessary to allot from any funds, which might be at the disposal of the Board, approximately $38,600.

Expended during the year, $150.36, which is the total expenditure to Dec. 1, 1913.

Cataumet Harbor.

Cataumet harbor is an indentation in the easterly shore of Buzzards Bay, on the boundary line between the towns of Bourne and Falmouth. The harbor, while protected from northerly and easterly winds, is open to the southwest winds prevailing through the summer months. Only a small area partially protected by a shoal affords good summer anchorage. Leading from this harbor is a narrow and shallow channel into Squeteague Pond, affording an anchorage of 17½ acres with a depth of 5 feet.

In 1902 the Board reported three projects for improvement: one for the dredging of an anchorage basin in the harbor itself, the other two for dredging a channel to make available the

anchorage in Squeteague Pond. The cost of these projects varied from $17,050 to $46,530.

In the opinion of the Board, at that time, the advantages to the public of this improvement were not commensurate with the probable cost, and no work, other than a survey, was done.

On Aug. 20, 1913, a petition of Charles L. Underhill, and others, under chapter 481 of the Acts of 1909 and chapter 642 of the Acts of 1912, for the improvement of this harbor and Squeteague Pond, was presented. Hearing has been held, but no further action taken owing to lack of funds.

A map of this harbor is printed with the report of the Board for 1902.

Total expenditure to Dec. 1, 1913, $356.33.

Centreville River.

In 1910, under the provisions of chapter 481 of the Acts of 1909, a petition for an opening through the beach opposite Bumps River, between Centreville and Osterville, in the town of Barnstable, was presented.

Bumps River is a small stream flowing into Centreville River, which in turn flows into East Bay, improved under appropriations made by the Legislature. A channel 5 feet deep at mean low water, and about 2,350 feet long, has been dredged in Centreville River. This work was completed in 1911.

On Feb. 26 and Aug. 20, 1913, petitions, under chapter 481 of the Acts of 1909 and chapter 642 of the Acts of 1912, for improvement of this river by dredging and by removing certain rocks dangerous to navigation, were presented.

No work has been undertaken, owing, in part, to lack of funds.

Contribution, 1910, ... $1,500

Total amount expended to Dec. 1, 1913, $7,603.22.

Cohasset Harbor.

In 1910 and 1911 petitions were presented, under chapter 481 of the Acts of 1909, for the improvement of Cohasset harbor.

A survey was made and a project adopted providing for a stone breakwater extending from a point on Bassing Beach, about 1,200 feet northeasterly from its southwesterly end. This breakwater, about 800 feet long, was completed in October, 1911.

Under contract of July 18, 1910, an anchorage basin and channel leading therefrom to the town landing was dredged, the anchorage basin to 6 feet at mean low water over an area about 300 by 1,100 feet, and the channel, in parts, to 4 feet at mean low water, 100 feet wide on the bottom and about 700 feet long. In addition, two other areas were dredged, but on account of ledges and bowlders the Board was unable to excavate the inner end of the channel to the full depth.

Under contract of May 5, 1911, the entrance channel and certain shoals were dredged and the anchorage basin enlarged. By means of a contribution by citizens of Cohasset the channel in the upper harbor was extended to the wharves at the mouth of James River, the depth of the excavation varying from 2 to 6 feet at mean low water.

On Sept. 17, 1913, a contract was entered into with Jeremiah P. O'Riorden to dredge to a depth of 6 feet at mean low water a shoal which had formed in the harbor channel near White Head, the contract prices being 27⅜ cents per cubic yard, measured in scows, and $6 per cubic yard for the removal of bowlders over 1 cubic yard in size. Work commenced Oct. 18, 1913, and was completed Oct. 23, 1913, material to the amount of 3,725 cubic yards being removed and deposited at sea. The total cost of the work was $1,177.89.

A map of this harbor is printed with the report of the Board for 1911.

Contribution: —
By the town of Cohasset, and others, . . . $20,691 88

Amount expended during the year, $658.17.

Total amount expended to Dec. 1, 1913, $51,350.10.

By the River and Harbor Act, approved Feb. 27, 1911, there was ordered a preliminary examination of this harbor, with a view to the dredging of a channel 150 feet in width and 8 feet in depth. Under date of June 14, 1911, the district engineer

officer reported adversely as to a survey to afford a basis for an estimate of improvement.

The total appropriation by the federal government for the improvement of Cohasset harbor, to June 30, 1913, is $10,000, and the total expenditure, $10,000.

Connecticut River.

By chapter 344 of the Acts of 1885 the Board was given jurisdiction over the Connecticut River and its banks.

Protective works were commenced on the river bank under authority of chapter 95 of the Acts of 1888, and have been carried out in other localities along the river, the method adopted having been explained, in detail, in previous reports. In addition, dikes have been built at Hatfield and Hadley.

There are several other localities along the river where banks have been eroded and where, particularly at freshet periods, considerable damage is done and will continue to be done unless further protective work is carried out.

Agawam. — On Feb. 17, 1913, a petition of the Quequechan Club, and others, under chapter 481 of the Acts of 1909 and chapter 642 of the Acts of 1912, for riprapping the west bank of the river at Agawam, was filed.

A survey and estimate of cost were made, and on Sept. 17, 1913, a contract was entered into with Daniel O'Connell's Sons of Holyoke, Mass., to pave with stone riprap, estimated to be about 1,000 tons, a portion of the west bank of the river extending about 450 feet southerly from the riprap placed by the Commonwealth in 1908, the contract price being $2.30 per ton for stone in place, including grading the bank to the required slope and building a low earth dike on top of the bank. Work commenced Sept. 29, 1913, and is expected to be completed early in December, 1913.

Appropriations: —

1894 to 1913, inclusive, aggregate, ... $13,000

Amount expended during the year, $101.

Total expenditure to Dec. 1, 1913, $11,531.19.

Chicopee. — On May 21, 1913, a petition of the mayor of Chicopee, under chapter 481 of the Acts of 1909 and chapter

642 of the Acts of 1912, for protection of the east bank of the river in the city of Chicopee, was presented.

A survey and estimate of cost were made, and on Nov. 12, 1913, a contract was entered into with Daniel O'Connell's Sons of Holyoke, Mass., to build a low concrete retaining wall about 720 feet long, and to place stone riprap in front of the same on the east bank of the river a short distance south of the South Hadley boundary line, to prevent further erosion of the bank at freshet stages, the contract prices being $7.70 per cubic yard for concrete in place and $2.06 per ton for riprap in place. The estimate of the amount of concrete required was 650 cubic yards, and of the amount of riprap, 400 tons.

This work was in progress on Dec. 1, 1913.

A contribution towards the cost of the work is to be made by the city of Chicopee.

Amount expended during the year, $82.85, which is the total expenditure to Dec. 1, 1913.

Hatfield. — On May 14, 1913, a petition of Calvin C. Coolidge, and others, for the protection of the bank of the river and the erection of dikes in the town of Hatfield, was presented.

A survey and estimate of cost were made, and on Oct. 1, 1913, a contract was entered into with Daniel P. Sheehan of Hatfield, Mass., to build on the west bank of the river an extension, 2,100 feet in length, southerly of the dike built by the Commonwealth in 1904, to prevent the overflow of the adjoining cultivated land at freshet stages. A period of high water during the past winter resulted in the making of two large holes and the removal of a considerable amount of soil.

The contract price was 46¾ cents per cubic yard of earth in place in the dike. Work commenced Oct. 21, 1913, and was completed Nov. 21, 1913, at a total cost of $1,060.23.

Appropriation: —	
Chapter 82, Resolves of 1903, ...	$7,500
Contribution: —	
By private parties, 1913, ...	$1,000

Amount expended during the year, $1,060.23.
Total expenditure to Dec. 1, 1913, $7,760.98.

Survey by the Commonwealth. — In addition to inspections made for the purpose of determining the location and extent of encroachments made without license, soundings have been made during the year in the river from the Holyoke dam northerly to the State line, and the results of the survey embodied in a report of the Chief Engineer from which the following extracts are made: Bench marks for the use of the sounding party were established at intervals of about a mile by running a double line of levels from the bench on the Holyoke dam to the bench on the dam at Turners Falls. From this point to the State line benches were used that had been established by very careful levels run by the Turners Falls Company.

The datum plane used was lowest water at Hartford, as established by General Ellis during his surveys between 1871 and 1878. Referred to this plane the elevation of bench "110" at Holyoke dam is 107.975 feet. To reduce to the datum of "mean sea level" at Boston, subtract 0.086 foot.

The level party were in the field from July 23, 1913, to Sept. 13, 1913, and the sounding party from July 29, 1913, to Oct. 17, 1913.

Recent surveys of this river in Massachusetts are as follows: —

From Holyoke southerly to the Connecticut line in 1902 and 1903 by the United States Engineers. A very complete report with maps was published as House Document No. 231, 2d session, 58th Congress. A copy of gauge readings taken at several points in the river in connection with the survey, but not published in the report, were furnished this office by the United States engineer officer at New London, Conn. The levels of this survey were also referred to the Hartford low-water base.

In 1908, 1911 and 1912 a plane table survey of the river from the Holyoke dam northerly to the State line was made. The sheets of this survey were used for the location of the soundings made this year. The soundings were taken on lines about 500 feet apart, using a rod where the depth was not over 16 feet and a chain for greater depths. Soundings shown on the sheets will be referred to the low-water slope as determined

from the lowest stage of the river this year which occurred on September 4 and 5. The length of the river covered by this survey is 51.39 miles. Measured on the middle line of the river it is 37.14 miles from the north side of the Holyoke dam to the south side of the Turners Falls dam, and 14.25 miles from this latter point to the State line.

Gauges were set at six points in the river between the Holyoke dam and the dam at Turners Falls, and were read twice daily from July 28 to Oct. 11, 1913. They were also set at four points above Turners Falls, and were read twice daily from Sept. 26 to Oct. 26, 1913. Daily readings were also obtained from gauges maintained by other parties at Holyoke dam, Sunderland bridge and Turners Falls dam. With these data the slope of the river can be determined for the summer flow.

In addition to the bench marks established for the sounding party, the elevations of many permanent reference points were determined and checks were taken upon a number of benches established by the Holyoke Water Power Company, the Turners Falls Company and the Fitchburg division of the Boston & Maine Railroad. At the request of the city solicitor of Northampton a line of levels was also run from the river to the court house in Northampton and bench marks established at this building. A complete record was made of the location of all bench marks and gauges and is now on file in the office of the Board.

Current observations were not taken, as the equipment and necessary funds to properly carry on such an examination were lacking. The velocity of the current, however, is not sufficiently rapid to require special consideration when the river is not at flood stages, except for about 3½ miles of river from the New York, New Haven & Hartford Railroad bridge at Montague City to the dam at Turners Falls, and for about 2 miles at French King Rapids.

The flow of the river has been carefully measured at the Holyoke dam and at Turners Falls for a number of years, and this information is available whenever required.

The banks of the river along most of its course through Massachusetts are low and alluvial in character, being overflowed in many localities during high freshets. In places, however, the

river passes through rock formation and the banks are high and permanent. Passing up river from the Connecticut line, ledge shows on the easterly bank at "the Narrows" in the southerly part of Springfield; at Holyoke below and at the dam which is built on ledge, and at various places on both sides of the river from the dam to Titan's Pier opposite Mt. Tom Junction; at North Hadley above the Hatfield Ferry, and about 1 mile above this point at a very abrupt turn in the river, also on the west bank in Hatfield; on the east bank in Sunderland opposite an island; on the west bank just above this island; on the east bank near the northerly line of Sunderland; on the westerly bank in Deerfield about 1 mile above the last-named point; on the easterly bank at the Boston & Maine bridge in Montague; on the westerly side in Deerfield at the New York, New Haven & Hartford Railroad bridge; at various points on both sides from this bridge to the dam at Turners Falls, which is built on ledge; on both sides from the suspension bridge above Turners Falls to the Narrows; on both sides from below the Horse Race to above French King Rapids; on the west side above and below Gill Bend; on the east side just above Munn's Ferry in Northfield; on the west side near Hermon School in Gill; and on the west side at Mt. Hermon bridge in Northfield.

During freshets the banks of the river are eroded at various places; but the most serious action is taking place at the following locations: the west bank in Agawam for several hundred feet south of the riprap previously placed by the State. This riprap has been extended this year by the Board to protect the bank in question. The east bank at Chicopee near South Hadley, which the Board is now protecting with a concrete retaining wall and riprap; the east and north bank at several points in Hadley between Fort River Brook and the turn above Elwell's Island, a distance of about 4 miles, and on the southerly bank in Hadley at the westerly end of riprap placed by the State; also on the southerly bank in Northampton from the first turn below the Northampton bridge up the river a distance of about 1 mile. At all of these localities the encroachment is persistent, as shown by various surveys made by the Board in the last sixteen years.

The survey shows numerous shoals alternating with stretches

of comparatively deep water from the Holyoke dam to Turners Falls. Above this point, barring the French King Rapids, there are fewer shoals and a more uniform depth of water. The deepest water was found at the upper end of the Horse Race, where one sounding gave a depth of 115 feet.

With the completion of these soundings there are now sufficient data for comprehensive studies preliminary to the development of the whole stretch of river above the Holyoke dam within Massachusetts territory.

The total amount expended on account of this river to Dec. 1, 1913, is $111,274.39.

Attention is here called to the report of the Connecticut Valley Waterway Board, appointed under the provisions of chapter 149 of the Resolves of 1912, dated March 12, 1913, on an investigation of the Connecticut River. The conclusions and recommendations of that Board were as follows: —

1. The demands of the cities and towns in the Connecticut River valley between Holyoke and the southerly boundary line of Massachusetts for ample facilities for navigation on the Connecticut River from Long Island Sound to the present head of navigation near the Holyoke dam, in order that they may benefit by a saving in freight charges on coal, cotton, lumber and other commodities which might be brought by water, and on manufactured articles which might be shipped by water from this community, should be urged before Congress. The State of Massachusetts, if necessary, should co-operate with the cities and towns in that section of the Commonwealth by making sufficient appropriations for defraying a part of the cost of doing such work as may be required by plans and projects which may be adopted by the federal government for providing such facilities for navigation.

2. The depth of water which should now be provided in that part of the Connecticut River between Hartford and Holyoke should be not less than that now available from Long Island Sound to Hartford. A depth of 12 feet would enable the class of barges which now pass through the new Barge Canal to proceed through Long Island Sound and up this river as far as Springfield and Holyoke. Whenever the present depth to Hartford is increased, a corresponding increase should be made in the depth of the channel as far as Holyoke.

3. In any law enacted by Congress for the construction of a dam across the Connecticut River at any point thereon between the mouth of said river and the Holyoke dam, it should be provided that a lock be built in said dam of sufficient dimensions for the convenient passage of water craft. Plans for said dam should provide for a depth over the sill in the

lock not less than the ultimate depth to be provided in said river between its mouth and Hartford.

4. Any law enacted by Congress for the construction of a dam across the Connecticut River at any point thereon between the mouth of said river and the Holyoke dam, which provides not only for the improvement of navigation but also for the development of power for commercial or other uses, should require payment to the federal government for the privilege granted.

5. It is recommended that in case any corporation, duly authorized by Congress to relocate and contruct a dam across the Connecticut River at Windsor Locks in the State of Connecticut, should fail to build the same, then the Board of Harbor and Land Commissioners, acting jointly with representatives of the State of Connecticut, shall investigate the matter and report to the General Court such plan or plans as it may deem necessary or desirable for relocating and constructing said dam, with a lock therein, the work to be done by the State of Massachusetts and the State of Connecticut acting jointly, for the purpose of improving navigation on said river and developing and utilizing the water power at this locality.

6. The several cities and towns bordering on the Connecticut River in the State of Massachusetts, both above and below the Holyoke dam, should acquire, by purchase or otherwise, a part of the water front, the same to be reserved for commercial purposes and use in connection with an improved river channel.

7. The several cities and towns bordering on the Connecticut River should build, equip, operate and control such piers, wharves, docks and landings on the river frontage, with suitable rail connections between the same and any existing railroad, as may from time to time be necessary for use in connection with an improved river channel, there being at the present time an opportunity to acquire land for this purpose, under favorable conditions.

8. The Commonwealth should co-operate with the several cities and towns bordering on the Connecticut River in providing channels of approach from the main channel and terminal basins in said river, to such piers, wharves, docks, and landings, as may be necessary, and should pay the cost of providing such approach channels and terminal basins.

9. River lines should be established by the Commonwealth from time to time along the Connecticut River, limiting the projection into the river of structures built along its banks under authority of law.

10. A survey should be made by the Board of Harbor and Land Commissioners for the purpose of determining the depth of water and the character of the bottom of the river from a point a short distance below the Holyoke dam to the northerly boundary line of Massachusetts; also surveys, plans and estimates of cost of providing canals, locks and other necessary works at or near the rapids and dams on said river at Holyoke

and Turners Falls, also at French King Rapids and at all other places on said river where work of this character would be necessary in reopening to navigation the whole length of the Connecticut River in Massachusetts above the Holyoke dam.

11. Surveys and examinations should be made by the Board of Harbor and Land Commissioners of the tributaries of the Connecticut River for the purpose of ascertaining facts concerning water power, improved and unimproved, and other necessary and useful data.

12. It is recommended that further appropriations be made for protective work along the banks of the Connecticut River; also appropriations for such work along the banks of the tributaries of said river, to be carried out in such places and to such extent as the Board of Harbor and Land Commissioners may deem necessary; and that all work of this character be done under the charge and direction of said Board.

13. It is recommended that legislation be provided authorizing and directing the Board of Harbor and Land Commissioners, acting with such representatives of the States of New Hampshire and Vermont as may be appointed for the same purpose, to consider and formulate plans for conserving the head waters of the Connecticut River.

14. The Board recommends that the Legislature adopt resolutions in favor of a full and complete development of the entire length of the Connecticut River in Massachusetts, and that the Commonwealth co-operate with the federal government in carrying into effect projects of improvement for the benefit of navigation, and appropriate from time to time the necessary funds for use in connection with such appropriations as may be made by Congress for the improvement and development of the whole river in accordance with such plans and projects as may be adopted by the United States.

Surveys and Projects of the Federal Government. — The River and Harbor Act of Congress, approved March 4, 1913, provided for a preliminary examination and survey of the Connecticut River from Hartford, Conn., to Holyoke, Mass. In accordance therewith, under date of May 28, 1913, a report of Maj. George B. Pillsbury, Corps of Engineers, U. S. A., was made to the Chief of Engineers. In view of the wide interest taken in the subject of the improvement of this river as far as Holyoke, the following extracts from his report are printed herewith.

In speaking of the necessary channel depth, Major Pillsbury says: —

In order that a commerce may be developed of magnitude sufficient to justify the necessary cost of the improvement, it is obvious that the depth of the channel must be sufficient for economical navigation. The

necessary depth is evidently determined by the nature of the commerce and the character of vessels that must be used. In character the inward commerce will consist principally of bulk freight, such as coal, building material, etc., the greater portion of which will come from New York harbor and adjacent points, and the outward commerce will be package freight destined to the same point for distribution. It can hardly be expected that such traffic will develop if it be subjected to transshipment en route, for it is doubtful whether the economy in water carriage would compensate for the cost of such transshipment, the incidental delay would be most prejudicial, and the necessity for special facilities and equipment would lead to restrictive monopoly. Similarly, no extensive commerce can be expected if vessels must discharge a portion of their cargo before proceeding up the river, for the necessary adjustment of shipments would subject the traffic to great inconvenience. If the improvement of the river is to be commercially successful, steamboats and barges must be able to proceed from New York to their river destinations without breaking cargo, and these vessels must consequently be suitable for navigation in Long Island Sound. Experience has amply demonstrated that barges suitable for safe and economical navigation in the sound should be of at least 9-foot draft, and this draft is as a rule, exceeded. The barges on the river below Hartford are loaded to a draft of from 9 to 10 feet, carrying thereon from 700 to 825 tons. The steamboats plying between Hartford and New York have draft of 10½ feet. While it is possible to work a vessel into a harbor on a draft nearly equal to the channel depth, it would not be commercially practicable to navigate a 20 or 30 mile reach of river without water under the keel. There is little question that a channel about 12 feet in depth will be necessary to accommodate vessels of the character required for the prospective commerce.

It is suggested that the approaching completion of the New York State Barge Canal will give rise to the construction of a large additional number of vessels of 10-foot draft, many self-propelled, and that advantage of opening this portion of the Connecticut River to these vessels is very material.

Those interested in the improvement have expressed a desire for a channel even with as little depth as 5 feet, partly in the thought that a commerce could be developed on such draft, and partly with the view that such an improvement would demonstrate the commercial benefits to be attained by a deeper channel, and lead to further expenditure for a greater depth. For the reasons that have been detailed, I am strongly of the opinion that the commerce developed would be very disappointing, and that neither purpose would be fulfilled. It is probable that plans for a 5-foot and a 12-foot channel would be radically different in character, and that a large part of the expenditure made to secure the lesser depth would not be useful for the greater improvement.

Under the head of "terminal facilities," the report says: —

It is obvious that the necessary terminal facilities can be provided at Springfield by condemnation of the riparian rights of the frontage held by the railroads, if necessary, and by bulkheading and filling a sufficient area beyond their tracks; or by dredging a channel to the area not so occupied. The cost will, however, be considerable. The advantages accruing from water transportation are strongly appreciated in Springfield, and it may be anticipated that the necessary expenditures will be made to provide facilities for handling the commerce, should the improvement of the river be undertaken by the general government.

Water Power. — The development of water power is closely related to the improvement of the river for navigation. The reach whose improvement is most difficult and costly is the Enfield Rapids, where, as has been described, there is a fall of about 35 feet in a distance of about 5 miles. A dam and lock at the lower end of the rapids offers a very satisfactory solution to the improvement of this reach. As the mills at Windsor Locks use but a portion of the flow of the river, the dam will make available a large and valuable water power. While the cost of the dam and accessory works, and of the flowage rights, will be heavy, it has been considered that the revenue from the sale of the power is sufficient to yield a profitable return on the investment.

In the past few years several companies, including the Connecticut River Company, have applied for congressional authorization of a dam at this site for the purpose of water-power development. The latter applicants have been prepared to construct a suitable lock without cost to the United States, and to conform to the other conditions recommended by the Chief of Engineers in the review of the last report upon the river, as detailed in paragraph 24 of this report. The situation in regard to water powers on navigable streams has been such that none of these applications have been granted, but it is understood that renewed application for authority for the construction of this dam will be made.

While the improvement of navigation and the development of water power at Enfield Rapids are co-ordinate in their general features, yet the demands of the two interests run contrary in detail. For navigation it is essential that a channel of adequate depth be constructed to the entrance to the locks, and that the current velocity in this channel be moderate. Could the dam be located at the foot of the rapids these two requirements could be met with comparative ease. A dam at this point would, however, flood the town and mills at Windsor Locks, and would occasion such extensive damage to property that the site cannot be considered. The lowest point at which a dam has been proposed is 1½ miles above the foot of the rapids, and in some of the plans for the development of power a site 2½ miles above the foot has been chosen. The present fall at low water in these distances is from 9 to 18 feet. Most of the plans proposed have contemplated the excavation of a channel

through a portion of this distance to serve the double purpose of a tail race for the wheels and an approach to the lock, but in none of these plans has the bottom of the channel been placed at a sufficiently low elevation to afford an adequate depth of water for navigation.

The depth to which the approach channel must be carried is evidently dependent upon the means adopted for improving the reach below the rapids. If it were attempted to improve this reach by open-channel regulation, the depth would be dependent upon the slope that the water surface would assume after improvement. The low-water discharge of the river is comparatively small under present conditions, and will be at times smaller after the water-power development is in operation, as it may be presumed that during hours of minimum power demand a portion of the flow will be stored. As the bed in this reach is unstable it would not be feasible to restrict the channel to a fixed cross section, and the average cross section would be far larger than the minimum secured. A very material reduction in the slope of this reach, with a consequent lowering of the mean low-water level at the foot of the rapids, is therefore to be anticipated if a channel of the necessary dimensions were secured by open-channel regulation. The depth to which the approach channel to the foot of the lock must be carried would be much greater than has heretofore been proposed, and the cost of this excavation, much of which would be in rock, would be excessive. In order, therefore, to secure the necessary channel to the lock, it appears necessary to resort to canalization of the reach below the rapids, by means of a lock and movable dam at some point above Hartford. Such a dam would impair, to some degree, the water power of the proposed development during low-water periods, but if the crest elevation were duly limited, the damage would be comparatively small, and would appear properly and necessarily consequent to the improvement of the river for navigation.

A certain conflict of interests between water power and navigation also exists above the proposed dam. It is obviously to the interest of navigation that the level of pool above the rapids be maintained at as high a level as is possible, in order that the dredging necessary to secure the desired channel depth be reduced to a minimum. The maximum elevation of the pool is fixed by the requirement that it shall not interfere with the water powers of the mills above Holyoke. The limiting height of the present dam, or of any new dam constructed by the owners thereof, is fixed by an order and decree of the Circuit Court of the United States for the district of Connecticut, passed June 16, 1884, in the case of the Holyoke Water Power Company *v.* the Connecticut River Company, a copy of which is appended. It appears that while this height has been and is now exceeded, the former company has taken the necessary legal measures to preserve its interest in question. The upper limit of the pool is thus fixed, presumably at level below that which it now has. In the operation of the proposed water-power development at Enfield Falls,

the primary power, which commands a considerably greater price than the secondary power, can be increased by storing the flow during hours of minimum power consumption for use during hours of maximum consumption. This storage can be effected only as a consequence of a previous reduction in the pool level during hours of maximum consumption. I am informed that this ponding of the water is regarded as essential to the successful commercial development of the power. Its importance is shown by the fact that the flow secured by drawing down the pool 1 foot would produce, with a 30-foot fall, in the vicinity of 10,000 horse power for eight hours. The cost of increasing the depth of the channels above the dam, to afford uninterrupted navigation during the hours when the pool is drawn down, would be great. I do not understand that the companies proposing to construct and operate the dam are prepared to bear this burden. An interruption of navigation during certain hours is not, however, unduly detrimental to barge traffic, and it is possible that even steamboat lines could so arrange their schedules as to operate with success under these conditions. It may be found sufficient to provide channels of the required depth at full pool level only. The utilization of the water power at Enfield Rapids would manifestly be of great benefit to the neighboring communities, and on this ground, as well as in consideration of the fact that the construction of the dam necessary for the utilization of this power would materially reduce the cost of improving the river for navigation, it may be considered proper to permit such drawing down of the pool as is essential to the commercial utilization of power.

Advisability of Improvement. — Although the channel depth herein proposed is somewhat greater than has heretofore been recommended, there appears to be little doubt that such improvement is feasible. The lift of the movable dam necessary to canalize the portion of the river below the rapids would be moderate, and the supplementary excavation required in the upper portion of this reach could be kept within due bounds. The natural channels in the pool above the Enfield Rapids show great permanence, and it is expected that no difficulty will be experienced in maintaining therein channels of the proposed depth. The advisability of the improvement is therefore reduced to the question of its cost.

In view of the large and important commerce that may be expected to result from its improvement, I am of the opinion that the Connecticut River, between Hartford, Conn., and Holyoke, Mass., is worthy of improvement by the general government if a channel of adequate depth can be secured, in connection with the development of power, at a reasonable cost; and I recommend that such detailed surveys and estimates as are necessary to determine this cost be authorized. As extensive data are now available, no general survey of the river is considered necessary.

The Board is informed that an allotment has been made for detailed surveys and estimates as recommended by Major Pillsbury and that field work has been completed.

In the opinion of the Board further appropriations by the State for the improvement of the Connecticut River are necessary and desirable.

Cuttyhunk Harbor.

Two stone jetties have been built at this harbor, one on each side of the entrance, the northerly jetty being about 1,025 feet long and the southerly one about 500 feet. The outer ends of these jetties were built up and strengthened in 1912.

Under contract of Dec. 10, 1909, a channel 60 feet wide on the bottom, 12 feet deep at mean low water, and about 2,200 feet long, extending from the outer harbor to deep water just inside the Narrows at the entrance to Cuttyhunk Pond, was dredged, also an anchorage basin 300 feet long and 150 feet wide just inside the Narrows, to the same depth.

The channel at the entrance has been widened, the basin extension at the town landing dredged to a depth of 12 feet at mean low water, 150 feet wide on the bottom and 200 feet long; and the channel from the basin into the pond dredged 6 feet deep at mean low water, 60 feet wide on the bottom and 750 feet long.

On April 2, 1913, a petition of the selectmen of the town of Gosnold for additional dredging was presented and is still pending. The desired work, if carried out, would, it is estimated, involve the expenditure of approximately $5,000.

In April and May, 1913, the south jetty was repaired by building a concrete spur wall 20 feet long, a concrete cap to jetty 48 feet long, concrete backing to 161 feet of jetty, and filling holes in jetty with concrete for a further distance of 44 feet. This was done to stop the sand from washing through and over the jetty into the channel. The total cost of this work was $589.50.

A map of this harbor is printed in the report of the Board for 1911.

Contributions: —	
Town of Gosnold, 1909,	$5,000
Town of Gosnold, 1912,	3,000
Total,	$8,000

Amount expended during the year, $589.50.
Total amount expended to Dec. 1, 1913, $47,700.67.

Duxbury Bay and Harbor.

On Aug. 27, 1913, a petition of the Duxbury Yacht Club, under chapter 481 of the Acts of 1909 and chapter 642 of the Acts of 1912, for a channel and anchorage basin, was filed.

In September, 1913, a report on a survey, together with plan and estimate of cost of dredging a channel 50 feet wide on the bottom and 6 feet deep at mean low water extending from the end of the Duxbury Yacht Club Pier easterly and southeasterly a distance of 1,900 feet to the present depth of 6 feet at mean low water in the channel dredged by the federal government in 1900, was presented. No dredging has been done since that year in the government channel, and it was found that about 2,000 feet of the shore end of the channel had shoaled so that in places it was bare at low tide.

It was planned to extend gradually the shore end of the proposed channel to make a basin 550 feet long with a width of 200 feet at the end of said pier. The federal channel ends at a wharf about 400 feet south of the yacht club pier, and is used for discharging coal and lumber, but cannot be reached except at high tide by vessels of small draft. The estimate for dredging and for supervision amounts to $13,200.

Amount expended during the year, $116.24, which is the total expenditure to Dec. 1, 1913.

The total appropriations by the federal government for the improvement of Duxbury harbor, to June 30, 1913, are $37,000, and the expenditures $32,000.

The following letters explain the improvement at present desired: —

Duxbury, Mass.

We beg to advise that in our judgment it is necessary to dredge the main channel from the Cow Yard to a point opposite the Duxbury Yacht Club Pier, having same, when completed, given a width of 80 feet and

a depth at mean low water of 6 feet. The town having recently acquired a portion of land near this point for a public landing, it would be materially benefited by the reason of this dredging, giving our fishing interests access to a public landing at low water, — a benefit they are now deprived of.

We also request that a narrow channel about 40 feet wide be cut through from the end of the main channel above referred to, at a point near the Duxbury Yacht Club Pier, to connect this channel with the Bluefish River channel. The main channel at the present time is more or less filled up, and it is our belief that allowing the Bluefish River water to be diverted in its course to said main channel would keep the same free from the constant filling it is now subjected to.

Trusting to receive your favorable action in this matter, we are

Very truly yours,

THEODORE W. GLOVER,
SIDNEY C. SOULE,
HARRY B. BRADLEY,
Selectmen of Duxbury.

DUXBURY, MASS.

We desire, in behalf of the town of Duxbury, to make application to your Board to dredge and widen the main channel in Duxbury harbor from what is known as the Cow Yard to a point at the Duxbury Town Landing near the Duxbury Yacht Club Wharf.

This improvement would be of material benefit to the commerce and industry of our town, and we respectfully ask that you give same such consideration as it deserves.

Thanking you for your courtesy in this matter, we are

Very truly yours,

THEODORE W. GLOVER,
SIDNEY C. SOULE,
HARRY B. BRADLEY,
Selectmen of Duxbury.

KINGSTON, MASS.

We have to say that many places in the channels leading to our wharves and landings are filling up to that extent that navigation is impeded and the dredging in some places is very desirable.

WALTER H. FAUNCE,
ALBERT E. HOLMES,
FRANK C. WOODWARD,
Selectmen of Kingston.

GLOUCESTER HARBOR.

The importance of Gloucester harbor, considered in 1885 as second in the Commonwealth, was recognized at an early date in the work undertaken by the Board of Harbor Commis-

sioners, a survey of the whole harbor having been made by the Commission on Harbors and Flats in 1865 and harbor lines established in 1866, at which time the area of the inner harbor bounded by these lines was about 143 acres. By reason of the subsequent establishment of other harbor lines this area had been reduced, up to 1885, by about 10 acres. This led to a re-survey of the frontage and wharf lines of the inner harbor in 1885–87, and the re-establishment of harbor lines to meet the need for wharves to accommodate a larger class of vessels and provide a greater area for movement and anchorage.

Surveys, projects, expenditures, etc., for this harbor are shown in the following statements from the report of the Chief of Engineers, U. S. A., for 1913: —

Harbor at Gloucester, Mass. — Situated at the southern extremity of Cape Ann, distant about 30 miles northeast by water from Boston Harbor. The outer harbor has an area behind the breakwater of approximately 350 acres at the 18-foot contour, and the inner harbor about 80 acres at the 12-foot contour.

In its original condition this harbor, which had a depth sufficient for the largest ships, contained several very dangerous submerged rocks and was entirely without protection against the sea and against heavy swells from the south.

The original project, adopted by the act of June 10, 1872, appears to have been for removal of five rocks, at an estimated cost of $10,606.20.

Under the original and modified projects the rocks were removed, Harbor Cove was dredged to the depth of 10 feet at mean low water, and the water front for a distance of 3,900 feet northeast from Fort Point was dredged to a depth of 15 feet at mean low water from the 15-foot contour to the wharf front, upon which there was expended prior to operations under the existing project approximately $86,000.

The project adopted by the act of August 18, 1894, provided for the construction of a breakwater from Eastern Point, over Dog Bar, to Round Rock Shoal at an estimated cost of $752,000 (H. Ex. Doc. No. 56, 48th Cong., 2d sess., no map; Annual Report of the Chief of Engineers, 1885, p. 534); and the act of June 13, 1902, authorized the termination of the breakwater at Cat Ledge and the application of any remaining balance "toward the work of removing Round Rock," at a reduced estimate of $416,083.43. Under that authority the breakwater was completed in 1905 as far as Cat Ledge. Upon a subsequent examination of Round Rock Shoal it was found that the cost of removing it to the level of the surrounding bottom, exceeding $800,000, was disproportionate to the probable benefits to navigation. The project has been reviewed by the Board of Engineers for Rivers and Harbors, which

recommends return to the original project of 1894 for a breakwater from Eastern Point to Round Rock Shoal, and its views are concurred in. The total cost of this extension is estimated at $354,000.

The river and harbor act of June 25, 1910, provided for the removal of eight groups of obstructing ledges or bowlders in the inner and outer harbors at a total estimated cost of $51,000. (H. Doc. No. 1112, 60th Cong., 2d sess., with map.)

The project of August 18, 1894, as modified, provides for the construction of a breakwater from Eastern Point to Cat Ledge (completed in 1905) and the application of any remaining balance "toward the work of removing Round Rock," but the Board of Engineers for Rivers and Harbors has recommended return to the original project, i. e., for a breakwater from Eastern Point to Round Rock Shoal, and its views are concurred in, but no congressional action has been taken on this recommendation.

No modification has been made in the project of June 25, 1910 (for removal of eight groups of ledges).

During the fiscal year 1,194 tons of stone were deposited in completion of the work of providing additional protection along the sea face of the breakwater, at an expenditure of $5,393.92; and $1,304.02 was expended for resetting 85 capstones and for drilling holes and setting pins behind 514 capstones. All work was for maintenance.

Work was continued during the fiscal year under the contract for removal of the eight ledges embraced in the project for ledge removal.

The amount expended under the project of August 18, 1894, to June 30, 1913, was $427,783, of which $16,004.16 was for maintenance — resetting and pinning capstones, protecting sea face of breakwater with apron of rubblestone, etc.

To June 30, 1913, the amount expended under the project of June 25, 1910 (for ledge removal), is $3,799.18, all for improvement.

The breakwater was completed to Cat Ledge in 1905 by the placing of 231,756 tons of stone. Since then, in 1911 to 1913, 17,538 tons have been placed in providing additional protection along the sea face. To prevent movement of the capstones in the breakwater an iron pin has been set behind each one.

The breakwater consists of a mound of rubblestone 31 feet wide at the top at mean low water, surmounted by a superstructure extending 17 feet above the grade of mean low water, formed by two dry walls of heavy split stone, inclosing a core of rubblestone, capped by heavy stones, forming a top course 10 feet in width, the slopes of the rubble structure being on the harbor side 1 on 1.3, on the seaward side 1 on 3 to grade 12 below mean low water and 1 on 1.5 thence to the bottom.

At the outer end a rubble mound for a site for a lighthouse has been built.

The project of June 25, 1910, for ledge removal is about 71 per cent completed.

Depths at mean low water: The outer harbor has prevailing natural

depths of 4 to 6 fathoms and ample anchorage grounds are available. The inner harbor has 20 feet or more, but navigation is practically limited to vessels whose draft permits them to reach the wharves, alongside which as far as John Pew & Son's wharves there is a depth of 15 feet. In the anchorage under the breakwater there is a depth of 30 feet. Harbor Cove has been dredged to 10 feet by the United States; and deepened by the State of Massachusetts to 15 feet for the entire area 50 feet outside the harbor lines except over ledges where the depth varies from 11 to 14 feet, which ledges are now being removed by the State.

The mean range of tide is 8.9 feet.

The commerce in 1906 amounted to 275,888 short tons; in 1909 to 218,165 short tons; in 1910 to 214,266 short tons; in 1911 to 223,533 short tons; and in 1912 to 217,753 short tons (valued at over $11,000,000), of which latter 143,412 tons were fish and salt. Over 38,000 passengers were carried to and from this port by steamer.

Freight rates are probably not affected, as the principal industry is fishing.

The breakwater has been completed, and it is expected that the project for ledge removal will be completed with the available funds. No estimate of additional funds is therefore submitted.

COMMERCIAL STATISTICS.

ARTICLES.	1908.	1909.	1910.	1911.
	Short tons.	*Short tons.*	*Short tons.*	*Short tons.*
Coal	48,932	55,634	53,165	49,924
Lumber	2,117	3,163	2,502	3,085
Brick	800	1,000	756	1,000
Stone, sand, and gravel	437	–	200	–
Oil	527	931	1,155	990
Iron	250	–	157	–
Salt	32,702	33,817	47,981	26,839
Fish and fish products	96,771	95,018	79,684	106,054
Wood	3,512	2,925	1,669	2,343
Ice	–	428	–	–
Fertilizer material	764	375	–	–
Tar	250	250	–	–
Livers	–	1,256	–	–
Sugar	–	–	15	–
Molasses	–	–	3	–
Plaster	–	–	–	170
Ballast	–	–	–	400
Miscellaneous	22,012	23,368	26,979	32,728
Total	209,074	218,165	214,266	223,533
Passengers carried, number	80,000	82,000	70,000	42,000

Vessel Classification, 1912.

Class.	American.	Foreign.	Total.	Total net registered tonnage.	Passengers.
Registered:					
Steamers	2,280	5	2,285	365,653	38,165
Sailing vessels	1,171	31	1,202	118,479	–
Barges	13	3	16	8,374	–
Miscellaneous	11	–	11	2,034	–
Unregistered:					
Steamers	294	–	294	–	–
Sailing vessels	13	–	13	–	–
Unrigged	900	–	900	–	–
Total	4,682	39	4,721	494,540	38,165

Freight Traffic.

Articles.	Amount (customary units).	Amount in short tons.	Valuation.
Fish and fish products	102,320 short tons	102,320	$10,516,875 07
Coal	29,235 short tons	29,235	148,293 55
Sand	2,000 short tons	2,000	3,000 00
Sugar	35 short tons	35	4,200 00
Molasses	500 gallons	3	250 00
Oil	15,000 gallons	86	1,500 00
	942 short tons	942	10,005 00
	50 barrels	13	1,000 00
Salt	41,092 short tons	41,092	265,950 00
Wood	470 cords	1,185	3,155 00
Lumber	2,345,000 feet	3,517	58,400 00
Stone	4,400 short tons	4,400	5,600 00
Brick	375,000 number	750	3,100 00
Miscellaneous	3,175 short tons	3,175	52,000 00
Total		188,753	$11,073,328 62
Miscellaneous		29,000	–[1]
Total tonnage		217,753	–

[1] Not ascertainable.

APPROPRIATIONS.

1823–1892	$86,000	Mar. 3, 1905	$50,000
Aug. 18, 1894	40,000	June 30, 1906	17,083
June 3, 1896	34,000	June 25, 1910	25,000
Mar. 3, 1899	40,000	Feb. 27, 1911	15,000
June 13, 1902	75,000		
Mar. 3, 1903	60,000	Total	$542,083
Apr. 28, 1904	100,000		

July 1, 1912, balance unexpended		$31,971 53
June 30, 1913, amount expended during fiscal year:		
For works of improvement	$772 77	
For maintenance of improvement	6,697 94	
		7,470 71
July 1, 1913, balance unexpended		$24,500 82
July 1, 1913, outstanding liabilities		50 89
July 1, 1913, balance available		$24,449 93
July 1, 1913, amount covered by uncompleted contracts		$19,593 72

The total expenditures by the United States for Gloucester harbor, to June 30, 1913, are $517,582.18.

Population of Gloucester (1910),	24,398
Value of assessed estates, April 1, 1913,	$25,588,173
Number of establishments,	76
Capital invested,	$5,121,421
Value of stock and materials used,	$5,187,875
Amount of wages paid during the year 1912,	$945,912
Wage earners employed,	1,976
Value of product,	$7,578,694

In the opinion of the Board further appropriations by the State for the improvement of Gloucester harbor are necessary and desirable.

Harbor Cove.

The dredging of Harbor Cove, under authority of chapter 110 of the Resolves of 1912, to obtain a depth of 15 feet at mean low water, was completed in August, 1912. Ledges and bowlders having been uncovered by this dredging, a contract was entered into on Dec. 26, 1912, with the Eastern Dredging Company, for their removal, the contract price being $18.90 per cubic yard. Under this contract 244 cubic yards of rock were removed to a depth of 15 feet at mean low water.

All work was completed Sept. 3, 1913, the total cost being $15,670.07. It is recommended that the unexpended balance of the appropriation, $4,762.99, be made available for use by this Board in improving any part of Gloucester harbor or its tributaries. A resolve to carry this recommendation into effect has been filed.

Appropriation: —
Chapter 110, Resolves of 1912, ... $20,000

Amount expended during the year, $6,698.45.

Total amount expended to Dec. 1, 1913, $15,670.07.

In compliance with the provisions of the River and Harbor Act of Congress, approved July 25, 1912, the United States engineer officer reported under date of Nov. 29, 1912, on his preliminary examination of this harbor with a view to removing certain ledges in Harbor Cove and securing a depth of 15 feet, to the effect that as no improvement of Harbor Cove is recommended as worthy of being done by the United States, there is no necessity for a survey. The views of this officer were concurred in by the Chief of Engineers, U. S. A., in his report of Feb. 3, 1913.

Breakwater between the Mainland and Ten Pound Island.

On Jan. 15, 1913, a petition of Benjamin H. Colby, and others, under the provisions of chapter 481 of the Acts of 1909 and chapter 642 of the Acts of 1912, for a breakwater in Gloucester harbor between the mainland and Ten Pound Island, was presented.

A public hearing was held on Feb. 19, 1913, and a survey made and plan prepared.

Ten Pound Island is situated on the easterly side of the upper part of the outer harbor, in a southwesterly direction from Rocky Neck on the mainland. The waterway between the island and the mainland is about 1,300 feet in width at mean high tide. In the middle of this passageway is a rocky shoal about 400 feet wide, with small, detached shoals of ledge or bowlders about 50 feet from each end of the large shoal. Parts of the shoal are exposed at low water, but it is entirely covered at high tide. The ledges in the passageways on the

east and west of the shoal are covered with 3 to 5 feet of water at low tide. The passageways are used by yachts and small craft to avoid the rougher water in the main channel and to shorten the distance from the inner harbor to Southeast harbor, so called. The Gloucester Yacht Club house is situated on Rocky Neck, just north of the passage between the island and the mainland.

The petitioners want a breakwater built on the large shoal and the detached ledges removed. It is claimed that boats frequently strike the shoal, which they would not do if it was covered by a breakwater. Incidentally the breakwater would make a smoother anchorage opposite the yacht club house and would provide some protection to small craft from southeasterly storms. The removal of the small ledges to a depth of 6 feet at mean low water will provide a clear channel for small craft on each side of the large shoal, 150 feet wide with a depth of not less than 6 feet at mean low water. The location of the large shoal can be clearly marked by beacons or buoys, so that the use of the passages by small craft need not be dangerous.

If a breakwater is built it should be 327 feet long with the top at grade 12 feet above mean low water and sides sloped 1½ to 1. The estimated cost of the construction of the breakwater and the removal of the separate ledges is $26,722. This matter is now pending.

Amount expended during the year, $164.97.

Annisquam River.

Before improvement of Annisquam River by the Commonwealth there was 7 feet at mean low water over the bar at the outlet of the river, and a channel, not less than 6 feet deep at mean low water, from the mouth to Wolf Hill, about 1½ miles from Gloucester harbor at the "Cut."

Up to July, 1907, a channel had been dredged, 50 feet wide and 6 feet deep at mean low water, from Gloucester harbor to Wolf Hill, a sea wall built on the easterly bank of the new channel, and chip stone placed in front of the sea walls and on the banks of the canal.

In 1909 the channel from the Boston & Maine Railroad bridge to the Blynman or Cut bridge was dredged, and two shoals north of the railroad bridge removed.

In 1912 a petition of the city improvement committee of the Gloucester Board of Trade, and others, under chapter 481 of the Acts of 1909, for further improvement of this river, was presented.

A project was prepared and adopted providing for dredging a channel 8,200 feet long, 50 feet wide on the bottom, and 8 feet deep at mean low water, from Gloucester harbor to Wolf Hill.

On July 30, 1913, a contract was entered into with the Eastern Dredging Company, the contract prices being 24 8/10 cents per cubic yard, the dredged material to be taken to sea or deposited on shore, and $10 per cubic yard for removing bowlders over 1 cubic yard in size. The amount of material to be removed is estimated to be 78,000 cubic yards scow measurement, and it is provided that the work be completed Dec. 31, 1913. Work commenced Nov. 17, 1913, and on Dec. 1, 1913, was in progress.

This river is used for the transportation of coal and other supplies, also by a large number of pleasure boats and power fishing boats.

A map of this river is printed with the report of the Board for 1911.

Amount expended during the year, $368.27.

Total amount expended to Dec. 1, 1913, $65,179.69.

Lobster Cove.

Lobster Cove is a tributary of Annisquam River, in Gloucester. By means of an appropriation made in 1909 a channel was dredged, 50 feet wide on the bottom and 6 feet deep at mean low water, from the channel of this river, near the Annisquam Yacht Club house, to a point opposite Fish Market Wharf.

Under contract of Nov. 18, 1910, an anchorage basin, 268,000 square feet in area, was dredged to a depth of 6 feet at mean low water, and the channel, 500 feet in length, connecting the anchorage basin with the main channel of this river, widened and dredged to the same depth.

Contribution: —
City of Gloucester, 1910, ... $1,500

Total expenditure to Dec. 1, 1913, $19,103.98.

Mill River.

The tidal portion of Mill River, in Gloucester, a tributary of Annisquam River, extends from the end of Wheeler's Point to the mills at Riverdale, a distance of about 1 mile. At the mouth of the river, before improvement, a bar existed, covered at mean low tide by about 2 feet of water. Above the bar there was a narrow winding channel varying in depth from 3 to 6 feet at mean low water.

In 1910 and 1911 petitions for improvement under chapter 481 of the Acts of 1909, were presented.

A survey was made in August, 1911, and an estimate prepared of the cost of dredging a channel 50 feet wide on the bottom and 6 feet deep at mean low water. Before decisive action on the above petitions had been taken, the Legislature, by chapter 138 of the Resolves of 1912, appropriated $5,000 for the improvement of this river. As this sum was, according to the previous estimates of the Board, quite insufficient for the work required, an allotment was made from the general appropriation under chapter 481 of the Acts of 1909, to be used in addition to the special legislative appropriation.

The project for improvement adopted in 1912 provided for dredging a channel and anchorage basin to a depth of 6 feet at mean low water, the channel to be 3,400 feet long and 60 feet wide on the bottom, and the anchorage basin to cover an area of about 34,500 square feet. All of the dredging was completed on Nov. 9, 1912, but during the progress of the work bowlders too large to be removed by the dredge were uncovered, as was also a portion of ledge near the middle of the channel a short distance north of the last turn off Riverdale over which there was a depth at mean low water of about 4 feet. Bowlders were removed at a cost of $250. This ledge was removed to a depth of 6 feet at mean low water at a cost of $200, the work being completed March 19, 1913.

Amount expended during the year, $3,688.60.

Total amount expended to Dec. 1, 1913, $16,739.61.

Little River.

A petition of Harry C. Foster, and others, under the provisions of chapter 481 of the Acts of 1909 and chapter 642 of the Acts of 1912, for a survey and estimate of cost of dredging a channel and basin in Little River, in Gloucester, was received Aug. 12, 1912. A hearing was held and a survey ordered. Upon the completion of this survey the cost of dredging a channel 60 feet wide and 6 feet deep at mean low water from Annisquam River to a point opposite the railroad station at West Gloucester, with a turning basin 200 by 250 feet at the terminus opposite Pines Pier, was estimated at $35,000. Owing to the large cost involved the Board decided not to make an allotment at present for carrying out the desired work.

Amount expended during the year, $862.93, which is the total amount expended to Dec. 1, 1913.

HERRING RIVER, HARWICH.

Under the provisions of chapter 66 of the Resolves of 1901 the Board made a survey and estimate as to the advisability and cost of improving the entrance to Herring River in the town of Harwich, and of erecting barriers for the protection of the beach in that vicinity. The object of such improvement was the protection of the shore line and the providing of a harbor of refuge for small sailing craft.

Under the project adopted two stone jetties were built, a new channel excavated through the beach to a width of 75 feet on the bottom and to the level of mean low water, the banks of the channel protected and a dike constructed across the old outlet of the river. This work was completed in 1905 at a total cost of $11,141.02. Subsequently a timber fence was built along the crest of the beach, and stone riprap placed to protect and secure the beach.

Under a contract made in 1909 the easterly jetty was extended about 200 feet, the westerly jetty about 50 feet, and the whole length of each jetty strengthened and raised with heavy quarry grout.

On Sept. 18, 1912, a contract was entered into with John

R. Burke to dredge a channel to the depth of 6 feet at mean low water, extending to the 6-foot contour in Nantucket Sound, the channel to be 60 feet wide on the bottom outside of the jetties and 30 feet wide on the bottom between the jetties. Work was completed July 9, 1913, the contract price for this dredging and for dredging at Witchmere harbor being $13,700.

An examination made during the year showed that at times exceptionally high water flows across a low portion of the beach between the easterly stone jetty and the timber bulkhead, thus washing sand from the beach into the channel.

To protect the beach from further erosion it was concluded to build a heavy timber fence from the inshore end of the east jetty easterly along the crest of the beach about 200 feet. This work was in progress Dec. 1, 1913.

Contribution: —
By the town of Harwich, 1905, ... $2,000

Amount expended during the year, $9,430.10.
Total amount expended to Dec. 1, 1913, $32,432.10.

Hull Sea Wall.

By chapter 701 of the Acts of 1912 the Board was authorized and directed to build such a breakwater, retaining wall, sea wall or other structure in the town of Hull as is deemed necessary for protection from encroachment or damage by the sea of the outer Boston harbor shore extending from Gun Rock to a point near the westerly end of Green Hill, and authorized to expend for this purpose not exceeding $25,000. The project adopted was fully described in the report of the Board for 1912. All work was completed Sept. 20, 1913, and consists of a concrete wall 2,616 feet long with its top 21 feet above the level of mean low water, and 20 concrete spur jetties in front of the wall along the beach.

On Sept. 3, 1913, a petition of Edward A. McLaughlin, and others, for extension of sea wall at Green Hill, Hull, was presented.

A survey and estimate of cost were prepared, and the town of Hull having voted to contribute $9,000, a contract was en-

tered into on Sept. 17, 1913, with William Sears and James H. Connolly to build a concrete wall from the ledge near the end of the wall built under authority of chapter 701 of the Acts of 1912 and described above, to the boundary line between the towns of Hull and Cohasset, a length of about 1,400 feet, together with 15 concrete spur jetties, the top of the wall to be 22 feet above the level of mean low water. The purpose of this structure is to protect the shore at Green Hill in Hull from erosion by the waves in heavy storms. The contract price is $6.50 per cubic yard of concrete in place. Work commenced Sept. 19, 1913, and was in progress Dec. 1, 1913.

Appropriation: —	
Chapter 701, Acts of 1912, ...	$25,000
Contribution: —	
By the town of Hull, 1913, ...	$9,000

Amount expended during the year, $28,025.87.

Total amount expended to Dec. 1, 1913, $28,406.93.

Hyannis Harbor.

Lewis Bay.

This bay, in the towns of Barnstable and Yarmouth, was surveyed and examined by this Board in 1899, under authority of chapter 96 of the resolves of that year. Under contract of May 17, 1900, the channel leading to the wharves in the inner bay was dredged to 6 feet at mean low water, providing a channel from the sound to these wharves 150 feet wide in the upper, and 200 feet wide in the outer, portion.

In 1905 a channel was dredged across the bar in the eastern end of the bay.

A map of this bay is printed with the report of 1899.

Total amount expended to Dec. 1, 1913, $17,012.22.

Hyannisport.

On Dec. 27, 1911, a petition was received from James M. Prendergast, and others, under the provisions of chapter 481 of the Acts of 1909, for the construction of a jetty off Prince's Point, and for certain dredging at Hyannisport in the town of Barnstable.

In 1912 a project was prepared and a contract entered into on September 18 of that year for the building of a rubble stone breakwater on the southerly side of the harbor. This breakwater extends from low water in a southeasterly direction, about 1,100 feet, toward the southerly end of the breakwater built by the federal government, and protects the southerly portion of this harbor, which is used by small craft, from southwesterly storms, and prevents shoaling previously caused by the movement of sand easterly into this part of the harbor. A beacon, consisting of large blocks of granite securely fastened with iron clamps, has been built at the outer end of the structure. Two smaller beacons have also been built at intermediate points to mark the location of the structure. In addition, a concrete wall 82 feet long, protected by riprap, has been built across the beach from the inner end of the breakwater to the high-water line of the shore. Stone to the amount of 358 tons was taken from the foundation of an old pier in the harbor and from a rock near the end of the breakwater and used in the work. The removal of scattered rocks in the vicinity of this work, dangerous to navigation, is under consideration.

The contract prices were $2.40 per ton for stone in place and $3.25 each for iron clamps.

Work was completed Sept. 16, 1913.

Contribution: —
Private parties, 1913, ... $2,500

Amount expended during the year, $24,276.45.

Total amount expended to Dec. 1, 1913, $24,321.25.

Surveys, projects, appropriations, etc., of the federal government: —

Harbor at Hyannis, Mass. — The harbor of Hyannis, in dimensions, is about 2½ miles easterly and westerly and three-fourths of a mile northerly and southerly, and lies on the south shore of the peninsula of Cape Cod and about 15 miles to the westward of the heel of the cape, and is an important harbor of refuge for the smaller class of vessels passing through Nantucket Sound. Fifteen and one-half feet can be brought into the anchorage area behind the breakwater at mean low water. The mean range of tide at the entrance and in the harbor is 3.3 feet. The harbor is about 20 miles east-northeast from Vineyard Haven on

the island of Marthas Vineyard, Mass., and about 85 miles from the harbor of Provincetown, at the northern extremity of Cape Cod, which is the first sheltered harbor to be encountered after leaving Hyannis in rounding the cape.

This harbor, before improvement, was an open roadstead, exposed to southerly storms. About 8 feet at mean low water could be carried to the site of the present wharf of the New York, New Haven & Hartford Railroad Co.

In the years 1827–1838 a breakwater, 1,170 feet long was constructed of riprap granite, covering an anchorage of about 175 acres, the entrance to which has a depth of about 15.5 feet.

Between the years 1852 and 1882 extensive repairs were made, increasing the width of the base of the breakwater and the size of the stone forming its sides and top. Under the 1884 project the 36 additional acres had been dredged to 15.5 feet at mean low water, and two cuts, each 25 feet wide and 13 feet deep at mean low water, had been dredged in the channel leading to the wharf of the New York, New Haven & Hartford Railroad Co., which is about 1,500 feet from the entrance to the harbor, completing the project.

The sum of $123,431.82 had been expended at this harbor prior to operations under existing project.

The existing project, that of August 5, 1886, House Document No. 96, Forty-eighth Congress, second session, with map; also printed at page 619, Annual Report of the Chief of Engineers for 1885, with maps at page 560 of same report, provided for dredging to 15.5 feet at low water about 36 acres area north of the existing breakwater, so as to increase the deep-water anchorage by that amount, all at a total estimated cost at that time of $45,743.20, increased $30,568.94 in accordance with the report of November 27, 1899, printed in House Document No. 79, Fifty-sixth Congress, first session, also printed without map on page 1284, Annual Report of the Chief of Engineers for 1900, and adopted by the river and harbor act of June 13, 1902, making the total estimated cost $76,312.14. The only change by this modification was in the estimated cost of the work.

The project under which the work has been conducted and which has been completed provided for deepening to 15.5 feet at mean low water an area of about 36 acres north of the existing breakwater to increase the deep-water anchorage by that amount.

At the adoption of this project the 15.5-foot depth anchorage covered only about 47 acres, and the 36 additional acres to be dredged carried a depth of from 7 to 15.5 feet of water at low water.

The total amount expended on this project to June 30, 1913, was $74,112.19, of which $161.43 was applied to maintenance. No work was done and no funds expended during the fiscal year ending June 30, 1913.

Some deterioration has taken place in the depth of the harbor, and in the extreme northwesterly corner it is 9.6 feet at mean low tide.

The greater portion of the area dredged maintains its depth.

The principal value of this harbor to commerce is as a harbor of refuge for coasters and fishing vessels. The actual commerce of the place is, in general, lumber and other building materials, coal, and fish, aggregating in the last calendar year 3,064 short tons, valued at $243,728. So far as known, the improvement has had no effect on freight rates.

It is proposed to expend $24,000, the amount appropriated by the river and harbor act of March 4, 1913, for maintenance, in restoring the depth of 15.5 feet at the points where shoaling has occurred. This amount being sufficient for the purpose, no estimate is submitted for the fiscal year ending June 30, 1915.

Commercial Statistics.

The following statistics for the year 1912 relative to the commerce of the harbor at Hyannis, Mass., were compiled under the direction of this office from various available sources. Season of navigation, year 1912, the entire year.

Vessel Classification.

Classes.	American.	Foreign.	Total.	Net registered tonnage.	Passengers.
Registered:					
Steamers	7,012	–	7,012	126,054	2,945
Sailing	2,343	11	2,354	92,723	1,390
Barges	9	–	9	6,300	–
Unregistered:					
Steamers	3,530	–	3,530	10,590	1,060
Sailing	1,874	–	1,874	5,622	153
Barges	8	–	8	6,500	–
Total	14,776	11	14,787	247,789	5,548

Included with "registered steamers" are 56 Government steamers, 20 tugs, 11 large steam yachts, 800 fishing steamers, 6,125 large motor fishing vessels.

Included with "registered sailing" are 266 large freight schooners, 827 large fishing vessels, 910 small schooners and sloops, 351 yachts.

Included with "registered barges" are 9 coal barges.

Included with "unregistered steamers" are 3,530 small motor boats.

Included with "unregistered sailing" are 1,874 small sailboats.

Included with "unregistered barges" are 2 dredges, 6 scows.

Freight Traffic.

Articles.	Amount in customary units.	Amount in short tons.	Valuation.
Coal	500 short tons	500	$2,000 00
Oil	85,200 gallons	266	11,928 00
Other produce [1]	2,073 short tons	2,073	207,300 00
Miscellaneous [2]	225 short tons	225	22,500 00
Total		3,064	$243,728 00
Increase over 1911		630	–

[1] Included with "Other produce" are 13,490 barrels of fish.

[2] Included with "Miscellaneous" are 225 tons of naval stores, vessel wreckage, anchors, lightship supplies.

In addition to the local commerce given above, an estimated amount of 36,786 tons, having an estimated value of $220,716, used Hyannis Harbor as a harbor of refuge.

Amounts Appropriated.

Previous projects		$123,431 82
Existing projects:		
Aug. 5, 1886	$10,000 00	
Aug. 11, 1888	10,000 00	
Sept. 19, 1890	8,000 00	
July 13, 1892	6,000 00	
Aug. 18, 1894	3,500 00	
June 3, 1896	6,000 00	
Mar. 3, 1899	2,162 00	
June 13, 1902 (allotted July 30, 1902)	20,000 00	
Mar. 3, 1905 (allotted Mar. 29, 1905)	8,173 25	
Mar. 4, 1913	24,000 00	
		97,835 25
		$221,267 07
Received from sale of material		20 68
Total		$221,287 75
Received from bondsmen of failing contractor, Jan. 18, 1909, act of June 13, 1902		500 00
Total		$221,787 75
July 1, 1912, balance unexpended		$243 74
Amount appropriated by river and harbor act approved March 4, 1913		24,000 00
July 1, 1913, balance unexpended		$24,243 74
July 1, 1913, outstanding liabilities		39 17
July 1, 1913, balance available		$24,204 57

The total expenditures by the United States for Hyannis harbor, to June 30, 1913, are $197,544.01.

Lynn Harbor.

A survey and map of Lynn harbor was made in 1866 under the direction of the State Board of Harbor Commissioners, and a harbor line established by chapter 313 of the Acts of 1867. In the report of this Board for 1867 the following statement appears: —

> The results of the survey of Lynn harbor for the purpose of establishing harbor lines have led us to make some suggestions to the city council of Lynn for the improvement of their harbor by constructing a riprap breakwater across the mouth of the harbor, dredging a deep basin in front of the new wharf line, and filling up certain flats and marshes with the dredged material. The proceeds from the sales of land created in this manner would defray the cost of the harbor improvement herein suggested. The city authorities have considered the plan favorably, and we have reason to believe that the suggestions will be acted upon at no distant day, and that the result will be greatly to increase the prosperity of Lynn.

Nothing was done to carry this project into effect and no improvements were undertaken by the Commonwealth until after work, as defined in a report of a board of government engineers, dated April 10, 1884, and as modified in 1888, was commenced.

Work done by the Commonwealth under the direction of this Board and the improvements made are as follows: —

The dredging of an anchorage basin outside the proposed location of Market Street extension to a depth of 6 feet at mean low water, and a channel of the same depth to connect the basin with the main harbor channel dredged by the United States.

This work was completed in 1910.

By chapter 137 of the Resolves of 1912 further dredging of the anchorage basin was authorized, and an appropriation of $20,000 made for the purpose. On May 28, 1913, a contract was entered into with Jeremiah P. O'Riorden to extend this basin and dredge an area of about 8 acres to 6 feet at mean low water. Owing to the provisions of this chapter and chapter 130 of the Resolves of 1913, with respect to the utilization of dredged material for filling purposes by the Metropolitan Park Commission, the city of Lynn and others, there was

delay in commencing work pending a determination of the areas of certain flats in the harbor, along the city frontage, belonging to the Commonwealth and under the charge of the Metropolitan Park Commission, and those belonging to the Lynn Yacht Club, and others, upon which so much of the dredged material as could be deposited from scows might be placed. The disposition of part of the dredged material has recently been provided for under licenses from the Board, which will allow the filling of about 7.5 acres of flats for the purposes of a public playground, and 4.8 acres, which can be brought into commercial and other uses.

The contract price for dredging, estimated to be about 74,000 cubic yards, is 20⅞ cents per cubic yard for material dredged and deposited on shore or flats, or taken to sea, and $11 per cubic yard for the removal of bowlders over 1 cubic yard in size.

Dredging was in progress Dec. 1, 1913.

On Nov. 29, 1913, a petition of John H. Cogswell, under chapter 481 of the Acts of 1909 and chapter 642 of the Acts of 1912, for enlarging the area of the anchorage basin in Lynn harbor, was presented. No further action has been taken on this petition.

Contribution: —
Lynn Yacht Club, 1910, ... $200

Total amount expended during the year, $1,122.01.
Total amount expended to Dec. 1, 1913, $14,109.21.

Plans and Projects for Improvement.

Legislation with reference to the development of this harbor, contained in chapter 501 of the Acts of 1909, directed the Board to examine Lynn harbor, the approaches thereto, the channels therein and the flats and foreshores thereof, to make surveys, and especially to examine any plans, details and projects for the development of this harbor, which might be submitted by the city of Lynn, and to report to the Legislature. A survey was made, and in November, 1909, plans and a report accompanying the same were submitted by the city. A report, as required by the terms of the act aforesaid, to-

gether with a plan prepared by the Board showing the new project under consideration by Lynn, was submitted in January, 1910. (See House No. 234 of 1910.)

The Board's summary as to the report and plan for the development of the harbor presented by the city of Lynn was, in part, that: —

If the whole area of flats as outlined on the plans is reclaimed, there would be about 311.6 acres behind the wooden bulkheads, exclusive of piers. This includes 39 acres of low land northeast of the proposed Market Street extension. The report estimates that 86.8 acres will be required for new streets to be built on the reclaimed flats, 24.9 acres for a railroad yard and 13.9 acres more for a sewerage-treatment plant, which leaves about 186 acres, or 8,102,160 square feet, for sale to finance the cost of development.

The flats in front of the bulkhead are to be dredged to a depth of 25 to 35 feet at mean low water, and the material used for filling the reclaimed flats behind the bulkhead.

Besides the 311.6 acres of reclaimed land filled to grade 16, 14 wharves are shown of varying width, from 500 to 1,400 feet in length, with channels and an anchorage basin in front 25 to 35 feet in depth at mean low water. The bulkhead and pier construction is all of wood. The anchorage basin is estimated at 130 acres. The two channels are 1,000 and 1,200 feet wide, respectively, the easterly one extending substantially along the present government channel and the other one extending westerly in front of the piers from the government channel to the Saugus River channel. The seaward end of both channels is 1,200 feet southerly of a line drawn from Sandy Point westerly to the bound near Saugus River. This line is called the Sandy Point–Saugus River base line.

The whole estimated cost of construction of the entire improvement, including dredging, piling, wooden bulkheads, streets and sidewalks, surface drains, water pipes, 37 miles of railroad tracks, 14 piers, wooden sheds on piers and sewage-treatment plant, aggregates the grand total of $11,890,538.

This does not include any estimate of the value of private flats to be taken in the working out of the project. Nor does it include any estimate of damages to buildings or land above the high-water line now owned and used by private persons.

The Board's comments on the bill and project for the consideration of the Legislature were: —

There is in the bay made by Nahant on the east and the Point of Pines on the west a large area of mud flats exposed at low water, and in hot weather made offensive by sewage deposits. The original high-water line around this concaved Lynn shore is not now well defined, but can be

fixed with reasonable certainty. From that line seaward the shore owner has title in fee, subject to certain rights and easements, to the flats for a distance of 100 rods. Beyond the 100-rod line the Commonwealth owns all the exposed flats and land under the water.

The harbor line of 1867 above referred to is much nearer the 100-rod line than the bulkhead line, as shown by the engineers on the Lynn plan submitted to this Board.

If the filling of flats is made, as proposed, to the latter line all the flats of the shore owners will be filled and a large area of Commonwealth flats in addition.

If the project is carried to completion it would cover the offensive sewage deposits, improve the anchorage and inner channels, and when the United States dredges the approach channel would provide a good harbor.

The Commonwealth could well afford to release these flats provided the city would carry the project to completion. The charges for tide-water displacement under chapter 96 of the Revised Laws also should be waived in favor of the city of Lynn.

Just provision should be made for payment of damages to owners of the flats and shore. Substantially the same course should be pursued by the city of Lynn as was followed by the Commonwealth in reclaiming the South Boston flats, begun in 1873.

This project would not, like the South Boston project, be distinctly a harbor development. But it would certainly be a general public improvement if the land is needed for industrial development, and the Commonwealth could reasonably aid the improvement by releasing, free of charge, its title to the flats behind the bulkhead.

The consideration of this special report and the bill prepared by the Board was followed by the enactment of chapter 606 of the Acts of 1910, providing for the appointment of a special commission to consist of three persons, to be known as the Commission on the Investigation of Lynn Harbor.

Two reports have been made by the local commission, their preliminary one being dated June 13, 1912, and the other and final one, March, 1913.

Under the heading, "Financial Ability of City of Lynn to pay for Improvements," in the commission's final report, it is stated, "The improvements recommended by the commission will cost, without any assistance on the part of the State, the sum of $1,156,940."

The commission's specific recommendations were in part: —

For the purpose of abating the nuisance caused by the existence of tidal flats in Lynn harbor, and of improving the harbor for navigation and commerce, we report, as required by sections 2 and 3 of chapter 606 of the

Acts of 1910, as amended, that the city of Lynn should acquire all tide lands or flats in Lynn harbor lying between the wharf of the Lynn Gas and Electric Company on the east, Saugus River on the west, and the North Shore road on the north; construct a bulkhead from said wharf, extending as far in the direction of the Saugus River as the provisions of section 7 of said chapter 606 will permit; the city to fill the flats behind said bulkhead to a height averaging 15 feet with material dredged from the harbor in such manner as to result in a channel 20 feet deep at mean low water and 900 feet wide, south of the pier head line; the area between said bulkhead and pier head lines to be dredged to whatever depth may seem necessary in order to insure the abatement of said nuisance in this section of the harbor.

Chapter 543 of the Acts of 1913 provided in part that if the municipal council approves the report of the local commission in whole or in part, the question of further proceedings shall be submitted at the State election next following said approval to the qualified voters of Lynn.

As the majority of the votes cast on this question were in the negative, said act has no further effect.

Projects of the Federal Government. — In the development of the water front of the city of Lynn for commercial purposes on a large scale, which contemplates the construction of piers and docks accessible to vessels of deep draft, it is necessary to consider what work has been done and projected in this harbor by the federal government. The report of the Chief of Engineers, U. S. A., for 1913, gives information on these points: —

Lynn Harbor is distant about 14 miles by water in a northeast direction from Boston Harbor. It is about 3 miles in extent from north to south and has an average width east and west of about 1½ miles, the greater part being bare at low water.

In its original condition three narrow and crooked channels, in which the depth was but 6 feet at mean low water, extended from the wharves to the sea.

The original project, defined in the report of a board of engineers dated April 10, 1884, and as modified in 1888, was to dredge a channel 200 feet wide and 10 feet deep at mean low water from the sea (at White Rocks), a distance of 3,300 feet to a deep basin opposite Little Nahant, and from the basin nearly opposite Sand Point, a distance of 6,900 feet to a point 400 feet inside the harbor line, and an anchorage basin 500 feet by 300 feet and 10 feet deep at mean low water; the upper part of the channel to be maintained by occasional dredging, the lower part

by a training wall joining the land at Little Nahant, at an estimated cost of $182,000.

The amount expended on this project was $122,063.56, all for improvement, with which the entire channel and the anchorage basin as prescribed in the project were completed.

The project adopted by the river and harbor act of June 13, 1902, was to dredge a channel 200 feet wide, 4,500 feet long from the sea to the deep basin opposite Little Nahant; from the basin nearly opposite Sand Point, a distance of 7,000 feet to the anchorage basin, and the anchorage basin itself, 500 feet by 300 feet, all to the depth of 15 feet at mean low water, at an estimated cost of $162,937. The projected channel and basin were completed in May, 1908. Under the project to the close of the fiscal year ending June 30, 1913, $166,373.44 was expended; $164,373.44 being for improvement and $2,000 (in the fiscal years 1911 and 1912) for maintenance.

The existing project was adopted by the river and harbor act of June 25, 1910 (H. Doc. No. 948, 60th Cong., 1st sess., without map), and provides for the widening, to the same depth, and straightening the present channel and turning basin so as to make the former 300 feet wide and the latter 500 feet square, at a total estimated cost of $179,000. No modification has been made in the existing project since its adoption.

The total amount expended under the existing project to June 30, 1913, was $83,460.11, of which $6,400 has been expended for maintenance in restoring to its former dimensions the western (or Saugus River) channel in Lynn Harbor. From sales 39 cents has been derived.

The project is about 75 per cent completed. The inner channel commencing at Sand Point has been widened on the western side to 300 feet, with a depth of 15 feet at mean low water, for a distance of about 4,500 feet; and 225,343 cubic yards of material have been removed from other parts of the channel toward widening it to the projected width of 300 feet deep at mean low water.

The maximum draft that can be carried June 30, 1913, over the shoalest part of the locality under improvement is 15 feet at mean low water, excluding that portion of the channel and anchorage basin now being dredged. The mean range of tide is 9.3.

The commerce of the harbor benefited by the improvement consists chiefly of coal, lumber, and building materials, and amounted in 1910 to 433,808 short tons; in 1911 to 478,574 short tons; and in 1912 to 466,637 short tons, valued at over $1,850,000. The deepening of the channel to 15 feet enables the smaller or medium-size barges to carry full cargoes of coal to the wharves at all stages of the tide and barges of the greatest draft during the higher stages.

It is reported by local commercial interests that the cost of transportation was reduced 25 cents a ton by deepening the channel to 10 feet and further diminished by increasing the depth to 15 feet.

The work now under contract completes the project of improvement. No additional funds are therefore required.

Under a provision in the river and harbor act of July 13, 1892, $5,000 of the appropriation for Lynn Harbor was expended on the western (or Saugus River) channel in Lynn Harbor in obtaining a channel 8 feet deep at mean low water, and 150 feet wide, for an aggregate length of 2,200 feet. This channel had deteriorated, and in restoring it to its former dimensions 25,071 cubic yards of material, place measurement, were dredged during the fiscal year, at an expenditure of $6,400 (for maintenance) from allotments of $5,000 and $1,400 made June 25 and September 17, 1912, respectively, from the appropriation provided by the river and harbor act of March 2, 1907, for emergencies in rivers and harbors.

COMMERCIAL STATISTICS.

ARTICLES.	1908.	1909.	1910.	1911.
	Short tons.	*Short tons.*	*Short tons.*	*Short tons.*
Coal	285,818	293,764	272,986	313,487
Lumber	2,994	4,800	6,385	11,640
Sand	6,016	14,601	19,433	16,309
Oil	3,534	–	6,059	6,654
Lime	–	–	1,360	2,163
Cement	–	–	590	1,178
Gravel	–	–	672	200
Iron	–	–	777	873
Wood	–	–	–	433
Miscellaneous	55,000	46,030	125,546	125,637
Total	353,362	359,195	433,808	478,574

Passengers carried between Lynn and Nahant (1908), 189,969.

NOTE. — The line of passenger steamers between Lynn and Nahant has been discontinued because of the establishment of an electric street-car line.

Vessel Classification, 1912.

CLASS.	American.	Foreign.	Total.	Total net registered tonnage.
Registered:				
Steamers	68	–	68	27,330
Sailing vessels	190	27 21	219	104,859
Barges	62	–	62	28,668
Unregistered:				
Sailing vessels	2	–	2	–
Unrigged	632	–	632	–
Total	954	29	983	160,857

[1] Net registered tonnage not ascertainable.

Freight Traffic.

Articles.	Amount (customary units).	Amount in short tons.	Valuation.
Coal	352,835 tons	352,835	$1,548,018 63
Brick	50,300 number	140	850 00
Iron	1,051 tons	1,051	25,000 00
Gravel	1,245 tons	1,245	3,587 00
Oil	2,155,355 gallons	8,621	77,947 00
Lime	11,184 barrels	1,119	10,434 55
Cement	3,600 barrels	684	5,220 00
Sand	20,668 tons	20,668	15,841 28
Wood	362 cords	905	2,380 26
Lumber	7,912,799 feet	11,869	163,248 24
		399,137	$1,852,526 96
Miscellaneous,		67,500	–[1]
Total,		466,637	–

Appropriations.

1882–1902[2]	$153,500 00	Mar. 4, 1913	$84,000 00
Mar. 3, 1905	40,000 00		
June 30, 1906	97,937 00	Total of appropriations	$476,837 00
Mar. 2, 1907[3]	6,400 00	Receipts from sales	39
June 25, 1910	60,000 00		
July 25, 1912	35,000 00		$476,837 39

July 1, 1912, balance unexpended		$12,500 00
Amount appropriated by river and harbor act approved July 25, 1912		35,000 00
Amount appropriated by river and harbor act approved Mar. 4, 1913		84,000 00
Amount allotted from emergency appropriation, act approved Mar. 2, 1907		1,400 00
Receipts from sales		39
		$132,900 39
June 30, 1913, amount expended during fiscal year:		
For works of improvement	$21,560 11	
For maintenance of improvement	6,400 00	
		27,960 11
July 1, 1913, balance unexpended		$104,940 28
July 1, 1913, outstanding liabilities		16,093 07
July 1, 1913, balance available		$88,847 21
July 1, 1913, amount covered by uncompleted contracts		$23,979 18

[1] Not ascertainable.

[2] For itemized statement, see H. Doc. No. 421, 57th Cong., 2d sess., p. 267.

[3] Allotments June 25, 1912, $5,000, and Sept. 17, 1912, $1,400, for appropriation for "Emergencies in river and harbor works."

The total expenditures by the United States, up to June 30, 1913, for Lynn harbor, are $371,897.11.

Population of Lynn (1910),	89,336
Value of assessed estates, April 1, 1913,	$86,005,977
Number of establishments,	377
Capital invested,	$35,988,365
Value of stock and materials used,	$44,736,236
Amount of wages paid during the year 1912,	$18,607,798
Wage earners employed,	29,420
Value of product,	$80,544,498

In the opinion of the Board a plan for the development of the water front of the city of Lynn, the construction of a public pier equipped with modern appliances for the handling of freight, and the improvement of the harbor channels to permit vessels of deep draft to reach the developed frontage are necessary. It should not be expected that any expense which would be burdensome should be placed upon the city of Lynn, but improvements might be commenced on a comparatively small scale and the actual construction cover such a period of time that there would not be a large amount of money needed in any one year.

The Board has received the following letter from the Commissioner of Finance of the city of Lynn: —

The statistics relating to the amount of commerce coming into Lynn harbor are very concisely put in the special commission's final report, pages 86 and 87. It is unnecessary for me to state to you the plan or the amounts that have been expended by the United States and the State, as you are even more familiar with these than am I.

The E. H. Blood Associates have given the city of Lynn marsh and flat holdings of approximately 100 acres, bordering on the outlet of the Saugus River and in close proximity to the city's holdings at the outfall sewer of about 5 acres and flats. The city has also acquired for the so-called Market Street extension the T. A. Newhall wharf. The extension of the street now seems impracticable to carry out. By completing the taking in fee, it might be possible to utilize this property for a municipal dock. The city further owns a small dock at the rear of the Broad Street engine house.

While it is true the voters of Lynn did not approve of the proposed harbor improvement that was submitted at the last State election, I believe it is equally true that the sentiment of Lynn is decidedly in favor of improving its harbor, provided that the plan adopted shall not require

the city to so burden itself that the good to be accomplished shall be offset by the burden assumed.

I believe I am fairly stating the opinion of the municipal council of Lynn when I say that they consider your Board has the experience, judgment and facilities whereby it could devise a plan that should be a co-operation with and an extension of the work already done by the United States and the State of Massachusetts, so that in the future there might be a further co-operation of the United States, State and city in utilizing the above-mentioned holdings to the direct benefit of Lynn and indirectly benefiting both the State and the United States. It would also seem not impossible that the plan could be so devised as not to be burdensome to the city, and the development might, in a large measure, carry itself financially.

Trusting that your Board may see its way clear to recommend a study of the various plans and data in possession of the city, coupled with those in its possession, and that your Board may evolve a plan that will be practicable and possible, I remain,

Yours very truly,

FRANK A. TURNBULL,
Commissioner of Finance.

Further appropriations by the State for the improvement of Lynn harbor are, in the opinion of the Board, necessary and desirable.

MANCHESTER HARBOR.

Under contract of Oct. 18, 1907, a channel about 1,800 feet long and 75 feet wide on the bottom was dredged in Manchester harbor to a depth of 6 feet at mean low water.

In 1910, 1911 and 1912 petitions under chapter 481 of the Acts of 1909 were presented for further improvement of this harbor. In 1911 the inner portion of the channel from the railroad bridge down stream nearly to Bow Bell Ledge was dredged, the upper portion of the channel from the railroad bridge nearly to Reed's Wharf to a width of 200 feet on the bottom, and the balance to a width of not less than 100 feet on the bottom, all to a depth of 6 feet at mean low water. This work was completed Sept. 26, 1911, at a total cost of $15,970.28.

In 1912 the channel was dredged to the depth of 6 feet at mean low water, from the southwesterly end of the dredging done in 1911 to deep water in Massachusetts Bay, the width of the channel increased about 50 feet for a distance of about

1,500 feet below the railroad bridge, and an anchorage basin, about 150 by 200 feet, dredged to a depth of 6 feet at mean low water. This work was completed Nov. 8, 1912, at a total cost of $24,771.82.

On Feb. 5, 1913, a petition of the selectmen of Manchester, under chapter 481 of the Acts of 1909 and chapter 642 of the Acts of 1912, for further dredging, was presented. Under contract of May 28, 1913, with the Eastern Dredging Company, two areas in the harbor, between the railroad bridge and Bow Bell Ledge, were dredged to a depth of 6 feet at mean low water to widen the channel and form an anchorage basin. The contract prices were 23 9/10 cents per cubic yard, scow measurement, for dredging, and $8 per cubic yard for removing bowlders over 1 cubic yard in size. Work commenced Aug. 20, 1913, and was in progress Dec. 1, 1913.

Contributions: —	
Town of Manchester, 1907,	$2,500
Town of Manchester, 1911,	6,000
Town of Manchester, 1912,	11,000
Town of Manchester, 1913,	8,000
Total,	$27,500

Amount expended during the year, $17,226.62.

Total amount expended to Dec. 1, 1913, $61,934.30.

The total appropriations by the United States up to June 30, 1913, are $24,300, and the expenditures, $23,985.57.

Menamsha Inlet.

Menamsha Inlet, on the island of Marthas Vineyard in the towns of Gay Head and Chilmark, is a harbor of refuge for fishermen and light craft generally. The improvement of this harbor was begun under authority of chapter 323 of the Acts of 1897. This act authorized the Board to close the existing outlet of Menamsha Pond, to excavate a new outlet on the boundary line between Gay Head and Chilmark, and to build on the banks of the new outlet and extending into Vineyard Sound protective works for the purpose of fixing the location of the new outlet and thus marking the boundary line.

Under additional appropriations made in 1898, 1899 and

1903, stone and timber jetties were built at the entrance, and a channel 75 feet wide and 5 feet deep at mean low water dredged straight through the flats to the existing channel opposite the road to Vineyard Haven. The banks of the new channel were partially protected by stone riprap. The total expenditure through these years was $20,379.18.

The work done between the years 1906 and 1911 includes the strengthening of the jetties with stone; dredging the channel and an anchorage basin; protecting the banks of the anchorage basin and channel with stone riprap; the carrying out of a project providing for dredging the channel to a width of 75 feet on the bottom, and to a depth of 6 feet at mean low water, from Vineyard Sound southeasterly for a distance of about 1,500 feet, and a basin 200 feet long and 150 feet wide to the same depth; dredging a portion of the basin just inside the jetties; building an embankment about 200 feet in length, of sand protected by riprap, on the easterly side of the channel as a training wall; also the dredging of a channel 50 feet wide and 600 feet long from the easterly end of the anchorage basin, and the placing of riprap on the banks of the training wall.

From an examination made during the year 1912 it was found that the bulkhead previously built along the crest of the beach north of the entrance channel had been damaged by storms, and that at times of extreme high tides some material had been washed into the basin previously dredged. To afford the necessary protection about 244 feet of timber bulkhead was built on the crest of the beach during the year at a cost of $249.80.

Contribution: —
Town of Chilmark, 1910, ... $700

Amount expended during the year, $249.80.
Total amount expended to Dec. 1, 1913, $57,630.48.

Nantucket Harbor.

In 1903 rocks in Nantucket harbor, dangerous to navigation, were broken up and deposited on the shore at Coatue Point, at an expense of $1,043.50.

In 1905 an area on the northwesterly end of Hussey shoal, about 400 feet long and 300 feet wide, was dredged to a depth of 12 feet at mean low water at a cost of $4,848.85.

Under contract of July 15, 1907, an area about 500 feet square, north and east of the steamboat wharf, was dredged to a depth of 12 feet at mean low water. This work was completed Aug. 5, 1908, at a total cost of $9,980.24.

On Jan. 24, 1912, a petition of Benjamin Sharp, and others, under chapter 481 of the Acts of 1909, for further improvement of this harbor, was presented. By chapter 696 of the Acts of 1912 an appropriation of $10,000 by the Legislature was made available for this harbor, to be expended in dredging from the inner end of the channel dredged by the federal government to the wharves. A survey of a portion of the harbor was made, also an examination by members of the Board, who conferred with parties in Nantucket interested in developing the facilities for navigation and in providing a sufficient anchorage basin for both large and small craft, an important consideration being accommodation for yachts of larger draft than can now readily and safely anchor in the harbor because of insufficient depth.

A contract was entered into on Nov. 13, 1912, with Charles M. Cole, to dredge in the vicinity of the steamboat wharf to 12 feet at mean low water, and to enlarge and deepen a portion of the anchorage basin to 15 feet at mean low water. Before completion of work under contract two channels, 600 and 700 feet in length, respectively, were dredged to a width of 50 feet and depth of 15 feet at mean low water to wharves. The contract price was 24 3/10 cents per cubic yard, measured in scows. Work was completed July 31, 1913.

Contribution: —
Town of Nantucket, 1913, ... $1,000

Amount expended during the year, $26,508.31.
Total amount expended to Dec. 1, 1913, $42,779.78.

The improvements made in this harbor by the United States are as follows: —

Harbor of Refuge at Nantucket, Mass. — This harbor is the only one between the harbors of Marthas Vineyard (Vineyard Haven and Edgartown) and Provincetown, a distance of 100 miles, except the small harbor

of Hyannis on the north side of Nantucket Sound. It has a total area, below "First Point" on Coatue Beach, of about 502 acres, of which 102 acres has a depth of water in excess of 12 feet, and the object of the improvement is to make it a harbor of refuge for vessels plying between ports north and south of Cape Cod. Incidentally, it forms a commercial harbor for the island of Nantucket, and it is the only one on the island. So far as known, it has never been used to any great extent as a harbor of refuge. It is 32 miles from the harbor of Vineyard Haven on the island of Marthas Vineyard, Mass., and 80 miles from the harbor of Provincetown at the northern extremity of Cape Cod, which is the first sheltered harbor to be encountered in rounding the cape.

There is an available channel 15 feet deep at mean low water and 100 feet wide into the harbor. The mean range of the tide at the entrance and within the harbor is 3 feet.

In its original condition the channel entrance was obstructed by a bar 1.5 miles in width, on which there was only 6 feet of water at mean low tide, the channel being very crooked and subject to changes in location.

Between 1829 and 1844 an ineffectual attempt was made to dredge a channel through the bar; and $45,734.75 was expended prior to beginning operations under the existing project.

The existing project, adopted June 14, 1880 (House Doc. No. 18, 46th Cong., 2d sess.; p. 423, Annual Report of Chief of Engineers for 1880, Part I), and modified July 21, 1885 (p. 564, Annual Report of the Chief of Engineers for 1885), provides for the construction of two converging jetties on either side of the entrance to the harbor and for dredging when necessary in order to obtain a channel depth of from 12 to 15 feet at mean low water. Estimated cost, $375,000, exclusive of cost of dredging. In 1905 a further modification of the project was made by adding $100,000 for dredging to the original estimated cost of the project, making the total estimated cost $475,000.

The actual project under which work is at present conducted provides for securing channel depth of 12 to 15 feet at mean low water from Nantucket Sound into the harbor, that depth to be secured and maintained by means of converging jetties and by dredging between them.

No work was done during the fiscal year ending June 30, 1913.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1913, exclusive of outstanding liabilities, was $471,804, of which $85,522.85 was for maintenance. Of the maintenance expenditures, $7,210 was used on the west jetty, $6,312.90 on the east jetty, and $71,999.95 on dredging.

In the original project for this work the height of the jetties above mean low water was left to be determined by experience, and it will be some years before the work can be considered as completed. Up to the close of the fiscal year ending June 30, 1913, the eastern jetty has been built to its full length, but only of partial cross section; the west jetty had been built out 83 per cent of its total projected length. In 1912, a channel was dredged to a depth of 15 feet and approximately

200 feet wide with a central portion 17 feet deep and 100 feet wide. Since the work was done, this channel has shoaled, to from 15 to 18 feet. The shoalest part of the locality under improvement is 12.8 feet at mean low tide. The length of the channel between the inside and outside 17-foot contours is 1.4 miles.

The entire commerce of Nantucket is carried on at this harbor, and amounted in the year 1912 to about 33,742 short tons, valued at $1,476,131.20, consisting mainly of general merchandise, building material, coal, forage, grain, livestock, fish, and shellfish. The harbor was also used to a small extent as a harbor of refuge for small fishing vessels and yachts. So far as known the project has had no effect on freight rates.

No estimate is submitted for funds desired during the fiscal year ending June 30, 1915, as the funds available are considered sufficient for all contemplated improvement and maintenance till that date. It is proposed to apply the available funds and those appropriated March 4, 1913, for continuing improvement and for maintenance, to enlarging and maintaining the channel by dredging to 17 feet deep at mean low water for a width of 200 feet, and to such work on the jetties as may be desirable.

Commercial Statistics.

The following statistics for the year 1912 relative to the commerce of the harbor at Nantucket, Mass., were compiled under the direction of this office from various available sources:

Season of navigation, year 1912, the entire year.

Vessel Classification.

Classes.	American.	Net registered tonnage.	Passengers.
Registered:			
Steamers	8,628	249,227	44,566
Sailing	2,317	31,689	2,050
Barges	6	1,150	-
Unregistered:			
Steamers	4,080	12,240	1,540
Sailing	1,728	5,184	155
Total	16,759	299,490	48,311

Included with "Registered steamers" are 410 steamers on regular lines, 940 fishing steamers, 340 large motor fishing schooners, 125 steam yachts, 23 Government steamers, 7 tugs, 8 steam lighters, 6,775 motor vessels.

Included with "Registered sailing" are 43 coal schooners, 114 small freight schooners, 420 yachts, 1,740 small sailboats.

Included with "Unregistered steamers" are 4,080 small motor fishing and party boats.

Included with "Unregistered sailing" are 1,728 small boats.

Freight Traffic.

Articles.	Amount in customary units.	Amount in short tons.	Valuation.
Coal	13,111 short tons	13,111	$69,666 20
Oil	117,800 gallons	384	15,601 00
Lumber	1,367,275 feet b. m.	2,734	34,208 00
Shingles	1,242,000 pieces	155	4,968 00
Logs	325 pieces	89	1,950 00
Bricks	55,000 pieces	110	440 00
Cement	111 short tons	111	1,118 00
Stone	606 short tons	606	1,446 00
Other building material	85 short tons	85	595 00
Salt	116 short tons	116	928 00
Hay and feed	1,115 short tons	1,115	29,190 00
Grain	45,250 bushels	1,131	33,485 00
Live stock	191 head	102	37,730 00
Fertilizer	71 short tons	71	2,485 00
Other produce[1]	4,438 short tons	4,438	354,015 00
Manufactured iron and steel	285 short tons	285	39,400 00
Merchandise[2]	8,166 short tons	8,166	816,600 00
Miscellaneous[3]	933 short tons	933	32,306 00
Total		33,742	$1,476,131 20
Decrease under 1911		2,888	–

[1] Included with "Other produce" are 16,004 barrels of fish and shellfish, 42,000 gallons of scallops, 5,745 barrels of cranberries, 1,540 tons of ice.

[2] Included with "Merchandise" are 8,166 tons of freight not classified carried on regular steamer lines and sailing vessels.

[3] Included with "Miscellaneous" are 308 cords of wood, 550 barrels of tar and road oil, 45 tons of junk, 115 tons of naval stores and vessel wreckage.

Amounts Appropriated.

Previous projects		$45,734 75
Existing project:		
July 14, 1880	$50,000 00	
Mar. 3, 1881	25,000 00	
Aug. 3, 1882	25,000 00	
July 5, 1884	10,000 00	
Aug. 5, 1886	15,000 00	
Aug. 11, 1888	20,000 00	
Sept. 19, 1890	25,000 00	
July 13, 1892	25,000 00	
Aug. 18, 1894	25,000 00	
June 3, 1896	20,000 00	
Mar. 3, 1899	20,000 00	
June 15, 1902 (allotted July 30, 1902)	15,000 00	
Mar. 3, 1905 (allotted Mar. 29, 1905)	71,826 75	
Mar. 2, 1907	42,500 00	

Existing project — *Con.*		
Mar. 3, 1909 (allotted Apr. 10, 1909)	$20,000 00	
June 25, 1910	50,000 00	
Feb. 27, 1911	20,000 00	
Mar. 4, 1913	51,312 00	
		$530,638 75
Total		$576,373 50
July 1, 1912, balance unexpended		$7,533 70
Amount appropriated by river and harbor act approved March 4, 1913		51,312 00
		$58,845 70
June 30, 1913, amount expended during fiscal year, for maintenance of improvement		10 95
July 1, 1913, balance unexpended		$58,834 75
July 1, 1913, outstanding liabilities		42 99
July 1, 1913, balance available		$58,791 76

The total expenditures by the federal government to June 30, 1913, amount to $517,538.75.

Haulover Beach.

On Feb. 21, 1912, a petition of Benjamin Sharp, under the provisions of chapter 481 of the Acts of 1909, for examination and survey of Haulover Beach at Wauwinet, in the town of Nantucket, was presented.

It is claimed by the petitioner that by making an opening or channel through this beach the distance to the fishing grounds would be greatly lessened, and that in case of heavy weather a safe harbor might be provided. At the present time the course to the fishing ground is out to and around Great Point, a distance twice as great as by this proposed opening through the beach, and a course too dangerous in threatening weather.

Public hearing was given on this matter on Feb. 28, 1912, and on Feb. 19, 1913, and a preliminary examination of the locality has been made. No further action has been taken on this petition.

This beach has been made the subject of examination by the United States Coast Survey and by the United States Engineers with a view to ascertaining the various changes in the alignment of the beach and determining the feasibility of making an opening through it to connect that part of Nantucket

harbor with the ocean. Complex problems are involved in this question.

It is the intention of this Board to make at a convenient time an independent investigation to determine the feasibility and probable cost of opening and maintaining such a connection between Nantucket harbor and the ocean. A channel through this beach would be of great value to the fishing fleet and to other craft using Nantucket harbor.

Nonquitt, Dartmouth.

On Oct. 15, 1913, a petition of Henry F. Noyes, and others, under chapter 481 of the Acts of 1909 and chapter 642 of the Acts of 1912, for the construction of a breakwater in Buzzards Bay, extending from the shore at Nonquitt in the town of Dartmouth, was presented. This matter is still pending. A survey is to be made and an estimate of cost prepared. The matter will then be taken up for consideration and decision as to whether or not an allotment should be made to carry out the desired work.

Onset Bay.

On Jan. 24, 1912, a petition of Irving C. Hammond, and others, under the provisions of chapter 481 of the Acts of 1909, for widening and deepening the channel in Onset Bay to the Cape Cod Canal, and for dredging a turning basin, was presented.

A project for improvement was prepared and a contract entered into on June 25, 1913, with John R. Burke, providing for dredging a channel 2,500 feet long from Wickets Island to the steamboat wharf at Onset in the town of Wareham, the bottom width to be 100 feet and the depth 10 feet at mean low water. A turning basin of the same depth was subsequently decided upon, in addition to the channel dredging.

The contract prices are 28⅜ cents per cubic yard measured in scows and $10 per cubic yard for the removal of bowlders in excess of 1 cubic yard.

The dredging done to Dec. 1, 1913, amounts to 45,003 cubic yards, and work is still in progress.

Contribution:—
Town of Wareham, 1913, ... $1,000

Amount expended during the year, $6,848.59.
Total expenditure to Dec. 1, 1913, $6,913.59.

Pamet River, Truro.

On Feb. 15, 1911, Jan. 31, 1912, and Dec. 18, 1912, petitions of the selectmen of the town of Truro, and others, under chapter 481 of the Acts of 1909, for the improvement of Pamet River in the town of Truro, were presented. Hearings have been held on these petitions and a survey and estimate of cost of the desired improvement have been made. The work proposed, involving considerable dredging, the excavation of a channel through the beach, and the construction of stone jetties, would, if carried out, cost approximately $75,000. The large expense involved necessitates further study and modification of plans.

During the high tides of October, 1913, a part of Cornhill Dike at the mouth of this river was washed away. After an inspection and report, arrangements were made for the building of a timber bulkhead at that place. This work is now in progress.

Amount expended during the year, $18.
Total amount expended to Dec. 1, 1913, $127.27.

Paskamansett River.

Paskamansett River empties into a cove on the westerly side of Buzzards Bay, between Mishaum Point and Barneys Joy Point. Before improvement by the Commonwealth the river channel was from 5 to 10 feet deep at mean low water, but the river mouth was obstructed by a bar over which there was less than 3 feet at low tide.

The project for improvement provided for dredging a channel 150 feet wide, 5 feet deep at mean low water, and about 400 feet long through the bar at the mouth of the river. The work was finished on May 12, 1906, at a cost of $2,000.

In 1913 a petition, under chapter 481 of the Acts of 1909 and chapter 642 of the Acts of 1912, for the further improve-

ment of this river, was presented. Hearing was held on this petition, and on July 23, 1913, it was voted that the petitioners be granted leave to withdraw.

Total amount expended to Dec. 1, 1913, $2,187.35.

Plymouth Harbor.

In 1901 a shoal in the channel of Plymouth harbor near the wharf on Long Beach, which obstructed the passage of boats, was removed.

Under contract of Sept. 4, 1908, a portion of the channel through the bar near the Cow Yard — about 1,100 feet in length — was dredged to a width of 250 feet and a depth of 20 feet at mean low water; the main portion, about 5,000 feet in length, extending from deep water back of the bar to the wharf of the Plymouth Cordage Company, was dredged to a width of 150 feet and a depth of 18 feet at mean low water. The work was completed March 22, 1911, at a total cost of $142,339.09, of which one-half was paid by the town of Plymouth and one-half by the Commonwealth.

On Sept. 4, 1912, a petition of the board of selectmen of Plymouth, and others, under the provisions of chapter 481 of the Acts of 1909, for widening and deepening the channel to the wharves and enlarging the basin in this harbor, was presented. No action was taken on this petition, pending action by the United States government.

A map of this harbor is printed with the report of the Board for 1906.

Appropriation: —	
Chapter 132, Resolves of 1913, ...	$83,500 [1]
Contributions: —	
The Town of Plymouth and others, . . .	$71,294.55

Total amount expended to Dec. 1, 1913, $143,744.11.

Projects and Work of the Federal Government.

Plymouth Harbor is situated 45 miles by water south of Boston. Its outer anchorage, the "Cow Yard," is common to Plymouth, Duxbury, and Kingston. The harbor contains 2,000 acres, almost all of which, except the channels, is dry at low tide.

[1] To be expended by United States government.

In the original condition of the harbor the channel and low-water line were about 2,500 feet from the wharf at Plymouth. Long Beach, between the harbor and the ocean, was, for the most part, low and narrow, and liable to inroads by the sea that would injure or destroy the harbor.

All projects and expenditures prior to 1875 appear to have been for the construction of works for the preservation of the beach.

The original project for the improvement of the channel, adopted by the act of March 3, 1875, was to dredge a channel about one-half mile long, 100 feet wide, and 6 feet deep at mean low water, through the flats from the channel in the inner harbor to Long Wharf in Plymouth, at an estimated cost of $28,000.

Prior to operations under the existing projects, $198,859.22 had been expended in preserving Long Beach and in dredging under the project of March 3, 1875, as modified, which resulted in obtaining a channel about one-half mile long, 150 feet wide, and 9 feet deep; and a basin directly in front of the town wharves 866 feet long, 150 feet wide, and 9 feet deep. Of this amount $60,727.52 was expended for maintenance.

The existing project for the protection of the beach, adopted by the act of March 3, 1899 (printed in the Annual Report of the Chief of Engineers for 1899, p. 1089, no map), is to strengthen the sections of beach damaged by the great storm of November, 1898, and to restore Eel River to its former course, discharging into the head of the harbor, from its course into the sea to which it was changed by the storm. The estimated cost was $95,700.

No modification has been made in this project since its adoption.

In the report of January 20, 1899, submitting the project with estimate of cost, it was said:

> The following estimate for this work should be considered approximate only for the reason that further changes are likely to occur before the work can be accomplished, which changes may materially increase or diminish the amount of work necessary to restore the beach to a safe condition.

The accretion of the beach before the stone dike was built materially diminished the cross section of a considerable part of it and permitted its extension to protect other places where further erosion has occurred.

The existing project for dredging was adopted by the act of March 4, 1913 (H. Doc. No. 1194, 62d Cong., 3d sess., with map), and is to dredge a channel 18 feet deep at mean low water from that depth in the bay to the town wharves, 200 feet wide, increased at the entrance and on curves, at a total estimated cost of $167,000. By that act one-half of the amount ($83,500) was appropriated, the adoption of the project and the expenditure of the appropriation being conditional upon the Commonwealth of Massachusetts or other interests defraying the remaining half of the expense, which condition was accepted by the State on June 16, 1913, when an appropriation of $83,500 was made, but the amount has not yet been placed to the credit of the United States.

No expenditures were made and no work was done during the fiscal

year on either the project for beach protection or on the project for dredging.

The amount expended on the existing project for beach protection to June 30, 1913, was $100,176.28, including $18,800 for maintenance.

In addition to the aforesaid amount expended under the present project, $3,954.42 has been expended for maintenance in redredging the turning basin, which had been dredged at the wharves under the project of March 3, 1875.

By way of refundment, $4,530.12 was collected in 1906 as damages from the surety of a failing contractor.

No expenditure has been made under the existing project of March 4, 1913, for dredging.

Under the existing project for beach protection 12,459 linear feet of rubblestone dike have been built on Long Beach, which has resulted in strengthening the beach by the accretion of a large volume of sand and beach shingle; Eel River has been restored to its former course; 536 feet of stone dike have been built to prevent the river from being again turned into the sea; and 3,434 feet of the riprap dike (in two sections) extending along the seaward face of Long Beach have been repaired.

No work has been done under the existing project of March 4, 1913, for dredging.

The town of Plymouth at its own expense has restored and deepened to 10 feet at mean low water the channel and basin completed by the Government.

The maximum draft that can be carried, June 30, 1913, at mean low water, over the shoalest part of the locality under improvement is 10 feet.

The mean range of tide is 10.1 feet.

The commerce consists chiefly of coal and lumber, of which 39,860 short tons were received in 1908; 37,840 in 1909; 39,848 in 1910; 48,657 in 1911; and 37,620 in 1912, valued at about $200,000.

It is reported by the harbor master at Plymouth that the improvement of this locality by the United States has effected a saving of 50 cents per ton in freight rates.

No estimate of additional funds required is submitted, for the reason that the available funds in hand are sufficient.

COMMERCIAL STATISTICS.

ARTICLES.	1908.	1909.	1910.	1911.
	Short tons.	*Short tons.*	*Short tons.*	*Short tons.*
Coal	37,860	35,240	36,798	46,257
Lumber	2,000	2,250	2,650	2,000
Miscellaneous	–	350	400	400
Total	39,860	37,840	39,848	48,657
Number of passengers carried	53,987	58,246	58,985	53,893

Vessel Classification, 1912.

Class.	American.	Foreign.	Total.	Total net registered tonnage.	Passengers carried.
Registered:					
Steamers	185	–	185	82,625[1]	52,009
Sailing vessels	16	–[2]	17	4,171	–
Barges	20	–	20	14,893	–
Unregistered:					
Unrigged	–[2]	–	–[2]	–	–
Total	222	–[2]	223	101,689	52,009

Freight Traffic.

Articles.	Amount (customary units).	Amount in short tons.	Valuation.
Coal	35,320 short tons	35,320	$157,170 79
Lumber	2,000,000 feet	2,200	40,000 00
Total		37,520	$197,170 79
Miscellaneous		100	–[2]
		37,620	–

Appropriations.

1824–1896	$191,081 90	Damages from surety of failing contractor	$4,530 12
Mar. 3, 1899	85,000 00		
June 13, 1902	4,000 00		$397,612 02
Mar. 3, 1909	19,500 00		
June 25, 1910	10,000 00		
Mar. 4, 1913	83,500 00		
Total	$393,081 90		

Note. — From 1842 to 1859, inclusive, $90.16 was carried to surplus fund, to which account $331.94 was also carried June 30, 1912.

July 1, 1912, balance unexpended	[3]$10,000 00
Amount appropriated by river and harbor act approved Mar. 4, 1913	83,500 00
July 1, 1913, balance unexpended	$93,500 00
Amount (estimated) required to be appropriated for completion of existing project for beach protection	[4]20,700 00

[1] Includes one steamer of 447 tons, 184 trips.
[2] Not ascertainable.
[3] $331.94 carried to surplus fund June 30, 1912.
[4] Exclusive of the balance unexpended July 1, 1913.

Total expenditures by the federal government, to June 30, 1913, $302,989.92.

The Board has received the following letter from the authorities of the town of Plymouth: —

It is respectfully represented that the establishment of a bulkhead line from E. B. Atwood's wharf northerly to the wharf of the Robbins Lumber Company, with provision for adequate depth and width of a water way adjacent thereto, and in connection with Goose Point channel, would in the opinion of this Board materially benefit commerce and industry at this point.

Respectfully,

ALFRED S. BURNS,
EPHRAIM D. BARTLETT,
HERBERT S. MAXWELL,
Selectmen of Plymouth.

ROCK HARBOR, ORLEANS.

Under a contract made in 1907, a channel 1,300 feet long and 50 feet wide on the bottom, was excavated to the plane of mean low water. Owing to the elevation of the flats outside, this dredging gave a depth of about 4 feet in the channel at low water. The inner end of this channel was enlarged to form an anchorage basin about 200 feet long and 100 feet wide. The work was completed Sept. 9, 1909, at a total cost of $5,000.

In 1910 and 1912 petitions, under chapter 481 of the Acts of 1909, for the further improvement of this harbor, were presented. Hearings have been held, a survey made, and an estimate of cost prepared for carrying out a project involving the dredging of a channel 50 feet wide on the bottom, 2 feet in depth above the level of mean low water, and extending across the flats from a point 2,500 feet northwesterly from the entrance to the harbor to a point inside the harbor 500 feet above the entrance.

Plans and specifications were prepared for this work and proposals invited. All bids received were subsequently rejected as the prices were, in the opinion of the Board, excessive.

Amount expended during the year, $40.60.

Total amount expended to Dec. 1, 1913, $5,426.39.

Salem Harbor.

On May 1, 1912, a petition of J. D. Burns, and others, under the provisions of chapter 481 of the Acts of 1909, for a survey of Salem harbor, was presented.

A hearing was held, and the Board conferred with the chairman of the Commission on the Improvement of Salem Harbor, and other interested parties.

While this matter was under consideration a River and Harbor bill was passed by Congress and approved March 4, 1913, providing for a preliminary examination and survey of this harbor, with a view to providing a channel 12 feet deep at mean low water from the outer harbor to the mouth of the South River.

In April, 1913, the chairman of this Board attended a meeting at the office of the district engineer in Boston, who was at that time engaged in a study of the situation, with a view to preparing his report under the provisions of the River and Harbor Act aforesaid.

It was stated that this Board, so far as appropriations will permit, is willing to co-operate with the general government in providing such improvements for the benefit of commerce and navigation as present and prospective needs may demand.

The dredging done by the State in South River, the cost of which was borne in part by the local authorities, was cited, also the fact that an allotment is to be made by the Board for further dredging to the depth of 10 feet at mean low water, — a project subsequently completed and described on page 96 of this report. Under date of June 5, 1913, the district engineer officer reported that Salem harbor is not at this time worthy of the survey contemplated in the act. In this view the Chief of Engineers concurred in his report of Aug. 26, 1913.

The Commonwealth has not made any extended surveys of Salem harbor, excepting those in connection with dredging South River.

It is suggested that in considering localities where appropriations may be advantageously expended, it be made possible, by means of additional appropriations by the Legislature,

to carry into effect such works of improvement as may be required for the promotion of the commercial growth of Salem harbor.

Population of Salem (1910),	43,697
Value of assessed estates, April 1, 1913,	$37,415,300
Number of establishments,	140
Capital invested,	$9,861,483
Value of stock and materials used,	$12,134,099
Amount of wages paid during the year 1912,	$3,457,714
Wage earners employed,	6,991
Value of product,	$19,037,759

The projects of the federal government, appropriations, etc., follow: —

Harbor at Salem, Mass. — Salem Harbor is about 12 miles to the northward of Boston, Mass. The inner harbor is 1,750 feet wide at the entrance and 5,500 feet long between the 12-foot contours of opposite shores. It embraces about 110 acres of well-sheltered and unobstructed anchorage ground of a greater depth than 18 feet at mean low water. The outer harbor or bay is protected by islands and forms an excellent harbor of refuge. It has an area of about 320 acres not less than 25 feet deep, and about 457 acres not less than 18 feet deep. A channel 1,000 feet wide and 25 feet deep connects it with the open sea. The 18-foot channel through the outer harbor from the sea into the inner harbor is 1,300 feet wide at its narrowest point. The water front of Salem is separated from the anchorage in the inner harbor by extensive shoals. The principal wharves of the city are located on South River, which extend about 3,000 feet from Derby Wharf light to the head of navigation at Lafayette Street Bridge. In its original condition the harbor, from its entrance between Winter Island and Naugus Head, had a channel of ample width, 18 to 25 feet deep at mean low water extending to within 2,500 feet of the entrance of South River at Derby Wharf light, where for 1,500 feet the depth was 8 feet, and for the remaining 1,000 feet the depth was 6 feet to Derby Wharf light, where, however, the channel was contracted to 25 feet in width. Thence, in South River to the head of navigation, the low-water channel was less than 1 foot in depth.

The original project, adopted by the act of March 3, 1873, as enlarged in 1890, was to dredge a channel 5,100 feet in length, 8 feet deep at mean low water from that depth in the harbor, 300 feet wide at the entrance, 150 feet wide off Derby Wharf light, diminishing in width to 100 feet near the inner end of Derby Wharf, and from that point to the head of navigation 50 feet wide and 6 feet deep at mean low water.

Under the original and enlarged projects completed in 1894, the amount expended prior to operations under the existing project was $52,368.66.

The existing project, adopted by the act of March 3, 1905 (H. Doc. No. 303, 58th Cong., 2d sess., with map; Annual Report of the Chief of

Engineers, 1904, p. 878), is to provide a channel 10 feet deep at mean low water from that depth in the harbor to the outer end of the wharves, 300 feet in width at the entrance, gradually narrowing to 200 feet at Derby Wharf light, at an estimated cost of $12,000, appropriated in full by the act of March 3, 1905.

No modification has been made in the existing project since its adoption.

No work was done during the fiscal year.

To June 30, 1913, the total amount expended on the existing project was $11,500, all for improvement.

The approved project was completed on March 7, 1906, since which time no work has been done.

The maximum draft that can be carried June 30, 1913, to Derby Wharf light, the limit of the improvement, is about 8 feet at mean low water. Above Derby Wharf there is a depth in South River of about 8 feet to a point about 1,100 feet above Union Street Bridge; thence to the head of navigation at Lafayette Street Bridge, a distance of about 200 feet, the depth is 3 feet. The State of Massachusetts is now increasing to 10 feet depth the channel for a distance of about 1,900 feet from Derby Wharf to about 150 feet above Central Wharf, which wharf is about 450 feet below Union Street Bridge. The mean range of tides is 9 feet.

The commerce of South River affected by the project amounted in 1909 to 150,759 short tons; in 1910 to 40,006 short tons; in 1911 to 38,981 short tons; and in 1912 to 38,970 short tons, valued at over $161,000. The figures for 1910, 1911, and 1912 are incomplete, however, as no statistics were obtainable from one firm which in 1909 received 93,000 tons of coal.

The appropriation recommended will be applied to making a survey of and redredging the channel 10 feet deep at mean low water from that depth in the harbor to Derby Wharf light.

Estimate of Additional Funds required.

Amount that can be profitably expended in fiscal year ending June 30, 1915, for maintenance of improvement . . . . . [1] $7,500 00

COMMERCIAL STATISTICS.

ARTICLES.	1908.	1909.	1910.	1911.
	Short tons.	*Short tons.*	*Short tons.*	*Short tons.*
Coal	26,636[2]	143,766	34,602[2]	32,372[2]
Lumber	125	50	11	–
Wood	153	75	75	83
Railroad ties	1,800	6,860	4,469	4,891
Lime	–	8	–	–
Stone	–	–	849	1,635
Total	28,714	150,759	40,006	38,981

[1] Exclusive of the balance unexpended July 1, 1913.

[2] No statistics obtainable from one firm which in 1909 received 93,000 tons.

Vessel Classification, 1912.

Class.	American.	Foreign.	Total.	Total net registered tonnage.
Registered:				
Sailing vessels	28	1[1]	29	15,932
Barges	8	–	8	3,730
Total	36	1[1]	37	19,662

Freight Traffic.

Articles.	Amount (customary units).	Amount in short tons.	Valuation.
Coal	33,135 short tons[2]	33,135	$105,340 97
Ties	91,482 number	5,710	54,889 00
Lumber	35,469 feet	125	1,759 13
Total		38,970	$161,989 10

Appropriations.

1873–1892[3]	$53,000 00
March 3, 1905	12,000 00
Total	$65,000 00

Note. — In 1899, $631.34 was carried to surplus fund, and $500 on June 30, 1911.

Amount that can be profitably expended in fiscal year ending June 30, 1915, for maintenance of improvement $7,500 00

Total expenditures by the United States, to June 30, 1913, are $63,868.66.

South River.

By authority contained in chapter 111 of the Resolves of 1907 a channel was dredged in South River, Salem, 75 feet wide and 8 feet deep at mean low water, from about 200 feet below Union Street bridge, a distance of about 1,300 feet, toward Lafayette Street. This work was completed in 1909, at a total cost of $7,939.01.

On Jan. 29, 1913, a petition of William Stopford and others, under chapter 481 of the Acts of 1909 and chapter 642 of the

[1] Net registered tonnage not ascertainable.
[2] No statistics obtainable from one firm which in 1909 received 93,000 tons.
[3] Exclusive of balance unexpended July 1, 1913.

Acts of 1912, for further improvement of this river, was presented.

A survey and estimate of cost having been made, a contract was entered into on May 28, 1913, with the Eastern Dredging Company, and a channel 1,900 feet long, 100 feet wide on the bottom and 10 feet deep at mean low water dredged from a point 500 feet south of the end of Derby Wharf to a point about 150 feet west of the end of Central Wharf.

The contract prices were 35 cents per cubic yard, scow measurement, for dredging, and $8 per cubic yard for removal of bowlders over 1 cubic yard in size.

All work was completed Aug. 9, 1913, at a total cost of $5,283.12.

On June 25, 1913, a petition of the Salem Electric Lighting Company, under chapter 481 of the Acts of 1909 and chapter 642 of the Acts of 1912, for dredging this river from the end of the channel previously dredged to a point about 940 feet westerly therefrom, was presented.

An estimate of cost was made and conference held with the petitioners. Assurance has been given that a contribution towards the cost of the work will be made by the parties in interest if the Board will make an allotment. This matter is pending.

Amount expended during the year, $5,283.12.

Total amount expended to Dec. 1, 1913, $13,380.79.

Salters Point, Buzzards Bay.

On Sept. 3, 1913, a petition of Alvin F. Waite, and others, under the provisions of chapter 481 of the Acts of 1909 and chapter 642 of the Acts of 1912, for a breakwater in Buzzards Bay, off Salters Point, in Dartmouth, was presented.

A hearing was held on Sept. 10, 1913, attended by yachtsmen and others, who presented their views and stated their grounds for urging an allotment, for the purposes set forth in the petition.

A survey was made in October, 1913, and an estimate prepared of the probable cost of a breakwater in the location of Hunts Rocks, about 800 feet from the shore of Salters Point, these rocks being so located that they could be incorporated in the breakwater and provide a protection to small craft for

a considerable area. Later, when the necessity arises, the structure can be extended to furnish protection to vessels drawing 15 feet.

This estimate was based on a project comprising three sections: the first covering the cost of building a breakwater between the rocks 280 feet in length, the second, for an inshore extension 200 feet long, and the third, for an offshore extension 150 feet long.

A breakwater between the ledges would afford protection from the southeasterly winds to an area of about 4 acres, of which 1 acre has a depth of 10 feet, and the balance of 6 feet at mean low water. The inshore extension of 200 feet would add about 2½ acres to the projected area, with a depth of 6 feet at mean low water. The offshore extension of 150 feet would add 3 acres to the projected area, of which over 2 acres would have a depth of 10 feet at mean low water, and the balance a depth of 6 feet.

The estimated cost of this structure, including supervision, is approximately $36,900. No allotment has been made.

The Commonwealth has made no improvements in this immediate locality.

Amount expended during the year, $114.30, which is the total expenditure to Dec. 1, 1913.

Sandwich Harbor.

On April 10, 1912, a petition of the selectmen of the town of Sandwich, under chapter 481 of the Acts of 1909, for the improvement of Sandwich harbor, was presented.

This petition was later considered, and it was ordered that a survey be made, and an estimate of the probable cost of dredging, excavating through the beach and building jetties be prepared.

In August, 1912, the Board made personal inspection of the locality, including the dredged channel provided by the Sandwich Freezer Company for the purpose of allowing small boats with fish to reach its buildings located about 1½ miles from the bay.

A survey of this harbor and the adjoining territory was made in 1912, with a view to making a channel through the beach

where the entrance to the harbor formerly existed. A report, together with estimates of cost, was submitted by the Chief Engineer in January, 1913, from which the following extracts are made: —

The survey covers the harbor and outlets of streams entering the same, and about 1,000 feet in length of the beach between the harbor and Cape Cod Bay. Soundings were also taken in the harbor and for about 800 feet into the bay, to a depth of 9 feet at mean low water.

Sandwich harbor is about ¾ of a mile easterly from Sandwich village and about 1¼ miles southeasterly from the entrance to Cape Cod Canal. It is also about 2½ miles westerly from Scorton harbor. The present harbor is a small basin, nearly dry at low tide, created by the junction of several small tidal streams that flow through the adjoining marshes. The beach between the harbor and the bay is 600 feet wide between high-water lines, and rises to a height of 13 feet above mean low water. The entrance to the harbor is by a narrow channel extending easterly back of the beach to an opening through the same about a mile from the harbor.

About the year 1850 the Boston and Sandwich Glass Company had a cut made through the beach directly opposite the harbor. Later this cut was protected by the construction of a stone and timber jetty on its easterly side. The channel thus created was maintained in this location until about 1878, when a schooner broke through the jetty, causing the channel to shift to the easterly side of the same. The beach soon filled in across the old channel and gradually extended easterly, creating a new channel back of the beach with a shallow outlet through it to the bay. There is very little left now of the old jetty.

At present Sandwich harbor is used only by light-draft fishing boats. The town receives everything but fish by railroad, although formerly coal and other supplies came by water. Old plans show a wharf at one time on the westerly side of the harbor that was used by steamboats.

The Sandwich Freezer Company have dredged a channel about ⅜ of a mile long and 6 feet deep at mean low water, from their wharf and freezer plant to the harbor. This company received about 10,000 barrels of fish by water during the past year. Their boats draw about 4½ feet, loaded.

After a careful study of the problem at Sandwich I have concluded that a channel and basin with a depth of 6 feet at mean low water will provide ample facilities for the light-draft type of fishing and power boats that now use this harbor and are so numerous along this shore. I have not thought it necessary to prepare a project at this time for a greater depth, because it will be necessary to provide for the larger type of fishing craft and the medium-draft coasting vessels that would require a depth of about 12 feet. To furnish this depth would call for a very large increase in the cost of the project, and it would therefore seem desirable to first ascertain to what extent the above type of vessels would use the harbor if a sufficient

depth were provided before proceeding with the preparation of such a project.

Experience has conclusively shown that a channel cannot be maintained through the beach on this shore without the aid of substantial jetties and the protection of the easterly side of the channel against erosion by the action of the tidal currents. It is also impracticable to depend upon the tidal scour to deepen the proposed channel. The sand that will be removed by this action from the narrow portions of the channel will inevitably be deposited at or near the end of the jetties, creating a bar similar to that which now exists at the present entrance to the harbor. It is therefore desirable to prevent the scouring action of the tides as much as possible.

The project shown on the plan calls for dredging a channel in the location of the original channel, directly opposite the present harbor, from the anchorage basin to the 6-foot contour line in the bay, a distance of 1,200 feet. This channel will have a depth of 6 feet at mean low water and a bottom width of 50 feet with side slopes 3 to 1. On the easterly side of the channel there should be a stone jetty 700 feet long, and on the westerly side a stone jetty 400 feet long. Both jetties should be 5 feet wide on top with side slopes 1½ to 1 and the top at grade 14 feet. The easterly side of the channel through the beach should be riprapped. An anchorage basin is provided for in the location of the old harbor which will be 200 by 500 feet with a depth of 6 feet at mean low water.

Should the future commerce of the harbor require more depth and a larger basin, it can be furnished without the material reconstruction of any part built under the above project.

I have prepared two estimates of expenditures, as follows: —

Estimate No. 1 covers the complete cost of the 6-foot project as described above, and should be considered as the ultimate expenditure if the project is to be undertaken. It will be possible, however, to spread this work over several years. To provide for this contingency I have prepared estimate No. 2, which covers the cost of the least amount of the whole work that might be done in one year as a part of the project.

This estimate provides for dredging the channel to mean low water, 1,000 feet long and 60 feet wide on the bottom with side slopes 3 to 1; building a stone jetty on the easterly side of the channel 400 feet long, of the same section as the jetty in estimate No. 1. The cost of dredging an anchorage basin, building the westerly jetty, riprapping the easterly side of cut through the beach, extension of the easterly jetty, and final completion of the channel to the required depth, width and length called for in the project, are omitted from estimate No. 2.

Plans and specifications were subsequently prepared and proposals invited for excavating a channel across the spit or point of sand about ¼ of a mile northwesterly from the present

entrance to the harbor, the width to be 50 feet on the bottom, and the depth 3 feet at mean low water; and for protecting the easterly bank of the channel with stone riprap and a short stone and concrete jetty.

Proposals were received Sept. 17, 1913, but as the prices named were deemed excessive they were rejected. It was then concluded to divide the work into two parts, and after conference with parties who had previously submitted proposals, and with others, more satisfactory figures were obtained, and two contracts entered into on Oct. 29, 1913, as follows: —

With the J. S. Packard Dredging Company, for excavating a channel in the location and of the dimensions defined in the original specifications covering all the work for which proposals were received on Sept. 17, 1913. The amount of material to be excavated is estimated to be about 45,000 cubic yards, scow measurement; and the contract price is 35 cents per cubic yard, measured in scows.

It is provided that all the work shall be fully completed on or before June 1, 1914. Up to Dec. 1, 1913, work had not been commenced.

With William Sears and James H. Connolly, for protecting with stone riprap the easterly bank of the channel to be excavated under the contract with the J. S. Packard Dredging Company, and for constructing on the easterly side of the entrance to the channel a stone and concrete jetty.

The amount of stone required to protect the bank of the channel is estimated to be about 3,000 tons, and the amount of concrete, about 450 cubic yards.

The contract prices are $3 per ton for furnishing and placing stone, and $10 per cubic yard for providing materials and building concrete wall. It is provided that all work shall be completed on or before June 1, 1914. Up to Dec. 1, 1913, work had not been commenced.

Amount expended during the year, $191.27.

Total amount expended to Dec. 1, 1913, $417.71.

Saugus River.

Under authority of chapter 27 of the Resolves of 1905 the Board prepared and reported two projects for improvement of Saugus River, between the Salem Turnpike and Broad Sound,

as follows: (1) For a channel 12 feet deep from Broad Sound to the Salem Turnpike, estimated cost $77,000. (2) For a channel 15 feet deep from the open bay to the mouth of the river at the Point of Pines, and 12 feet the remainder of the way, estimated cost $125,000. No appropriation in addition to that for a survey was made, and no further work was done.

In February, 1913, further hearing was held on the petition of the Brett Lumber Company, and others, originally presented in February, 1912, for dredging in this river between the Boston & Maine Railroad bridge and a point above Fox Hill bridge. The Chief Engineer was directed to prepare plans and specifications, and on May 28, 1913, a contract was entered into with the Bay State Dredging Company, Limited, for dredging a channel 60 feet wide on the bottom and 6 feet deep at mean low water, extending from Fox Hill bridge to the Brett Lumber Company's wharf, a distance of about 3,850 feet.

The contract prices were 33⁹⁄₁₀ cents per cubic yard for dredging, measured in scows, and $5 per cubic yard for excavating bowlders in excess of 1 cubic yard in size.

Work commenced Aug. 4, 1913, and was nearly completed on Dec. 1, 1913.

The amount of material which will be removed upon the completion of the work is estimated to be 51,676 cubic yards.

Contribution: —	
By private parties, 1913, ...	$2,000

Amount expended during the year, $12,618.96.
Total expenditure to Dec. 1, 1913, $13,620.45.

Scituate Harbor.

Under contract of June 5, 1912, the channel from the wharves to the anchorage basin, a distance of 2,100 feet, was dredged to a depth of 6 feet at mean low water, the dredged channel being at least 60 feet wide throughout its course.

In addition to the work called for by the original plan of improvement, the inner corners of the two outer angles of the channel were dredged away to facilitate the passage of vessels at these points.

Work was completed Aug. 24, 1912, at a total cost of $8,975.05.

On Jan. 22, 1913, a petition of Charles H. Waterman, and others, under the provisions of chapter 481 of the Acts of 1909 and chapter 642 of the Acts of 1912, for further improvement, was presented.

An estimate of cost was made and plans and specifications prepared for further dredging.

On July 16, 1913, a contract was entered into with Jeremiah P. O'Riorden to dredge to the depth of 8 feet at mean low water a channel 100 feet wide on the bottom, extending from the harbor entrance to the wharves, a distance of about 4,450 feet. The contract prices were 27⅜ cents per cubic yard, scow measurement, for dredging, and $6 per cubic yard for excavating and disposing of bowlders in excess of 1 cubic yard in size.

Work commenced Aug. 6, 1913, and was completed Oct. 9, 1913, material to the amount of 55,141 cubic yards being dredged and deposited at sea and 38.9 cubic yards of bowlders removed.

One thousand ton barges can now enter this harbor with full cargo.

The channel was dredged to a width of 100 feet on the bottom.

The total cost of the work was $15,162.38.

On Sept. 24, 1913, a petition of William M. Welch, and others, for a channel from the main channel in this harbor to the pier and float of the Scituate Yacht Club, was presented. An estimate of cost was prepared, but no allotment for carrying out the desired improvement has been made.

Contributions: —	
By the town of Scituate, 1912,	$2,000
By the town of Scituate, 1913,	3,000
Total,	$5,000

Amount expended during the year, $15,162.38.

Total amount expended to Dec. 1, 1913, $24,137.43.

The total appropriations by the United States, up to June

30, 1913, for this harbor, are $104,680, and the expenditures, $104,590.98.

The views of the selectmen of Scituate and others as to improvements which are necessary and desirable, are expressed in the following letters received by the Board: —

GENTLEMEN: — Inasmuch as I have heard what the selectmen of Scituate are writing you as to the future needs of development of our harbor, I can only strongly indorse what they have said in regard to same, and say that in view of the great benefits already derived through the work of your Board, and in view of the fact that Scituate through those benefits is becoming recognized as a desirable port for shelter on account of its easy accessibility and safe harbor of refuge for craft drawing 8 feet of water or less, it would seem by far the wisest, in points of economy and otherwise, to continue the work by improving the entrance and enlarging the anchorage basin at the present time, as by so doing you would be rendering immediate relief to those craft who may, in stress of weather, desire to gain shelter, and at the same time give the necessary channel room for large cargoes to safely reach the docks.

Very respectfully,

C. H. WATERMAN,
Representative.

SCITUATE, MASS.

The work already done by your Board has been most satisfactory; the channel is of good depth, the approach much safer, and the increasing use of the harbor by craft of all descriptions has shown the wisdom of your Board in expending money in this locality.

Regarding the future we feel confident. The rapid growth of our town as a summer resort for people from all over the State, our building business, our fishing industry, and now the building of a beautiful house by the Scituate Yacht Club, and the agitation for the maintenance of a public landing, all indicate a larger use of the harbor than ever before.

Since the dredging of the channel last summer there have frequently been craft of over 1,000 tons enter to discharge cargoes at the wharves. The anchoring of other craft in the channel at these times is a source of inconvenience and danger, and we feel that this condition should be remedied by the widening of the channel, or the excavation of an anchorage basin of sufficient size to accommodate those who need to anchor within the shelter of the harbor.

The building of the yacht club house and its maintenance upon lines already laid down will draw visiting clubs from other ports, and while the dredging of a channel to the club pier is a matter of private enterprise, there should be space for their anchorage somewhere in the harbor outside the channel line.

There is need, too, of a public landing at the head of the harbor, where any one desiring to come for supplies or to depart from the harbor may do so without trespassing on private property and obstructing wharves owned by private parties and used for business purposes.

This proposition is being agitated, and while it may not be within your province to develop a matter of this kind, we feel it would be entirely proper that the State should join with us in dredging westerly from the present channel to the proposed wharf, that craft tying up there may be away from the traffic in the channel.

There should also be provided suitable anchorage space back of Stage House Beach, so called, where the shelter would be ample in rough weather, and where local and visiting fishermen could lie without interfering with the other uses of the harbor.

As to the present needs, we feel that the most pressing is the dredging of Deep Hole, so called, to the depth of 8 feet, and the widening of the entrance to the harbor to facilitate the entering of the larger craft in rough weather.

Our town has made appropriations the last two years of funds to be spent in conjunction with the State, and it is probable it will do so again in March.

We believe any further appropriation your Board can make will be appreciated not only by our town's people, but by the people in surrounding towns who look to this port for supplies of lumber and coal, by people from all over the State who come here to spend the summer, and by sea-going vessels which can then find shelter in this the most accessible harbor between Boston and Plymouth.

Again expressing our thanks for your consideration in the past, and hoping our cause has sufficient merit to warrant additional expenditures, we beg to remain

Yours truly,

SELECTMEN OF SCITUATE,
By FREDERIC T. BAILEY.

TAUNTON RIVER.

In accordance with the provisions of chapter 433 of the Acts of 1913, authorizing and directing this Board to investigate the improvement of Taunton River, from Weir village in Taunton to Fall River, in order to secure a channel 25 feet deep or approximating that depth, for the purposes of navigation, a report (House Document, No. 2138) has been made.

Public hearings were held in Taunton and Fall River, inspections made of the river, facts and statistical matter collected, and conferences held with the district engineer officer, who has prepared and forwarded to the Chief of Engineers,

U. S. A., a report on his preliminary examination of the same part of this river covered by this Board's investigations, in accordance with the provisions of an item in the River and Harbor Act of Congress, approved March 4, 1913.

The concluding pages of the Board's report follow: —

RECOMMENDATIONS.

The Board recommends the improvement of Taunton River from Fall River to Weir village in Taunton by providing a channel not less than 100 feet in width and not less than 18 feet deep at mean low water, with rectification of bends and a wider basin at the upper extremity of the channel, and that the necessary work be carried out in co-operation between the Commonwealth of Massachusetts, the federal government and municipalities, and in accordance with a plan of co-operative procedure substantially on the following basis: —

(1) The Commonwealth to furnish the War Department such surveys, maps, plans and other data relating to the river as have been made and collected by the Board and are now in its custody.

(2) The Commonwealth to purchase or take such land and flats in and adjoining that part of the river to be improved, as may be necessary, either for rectification of the present river channel or for a new channel, to carry into effect any accepted project of improvement, and to pay land damages, if any, resulting from said taking.

(3) The Commonwealth to pay all costs and damages, if any, for rights and privileges of depositing, on land and flats adjoining that part of the river to be improved, such material, dredged in this river for the purpose of providing the required channel, as may be necessary.

(4) The Commonwealth to appropriate $100,000 to be expended under the direction of the Board of Harbor and Land Commissioners for dredging part of the channel included in any project of the federal government for providing a channel of not less than 100 feet in width and not less than 18 feet in depth at mean low water from Fall River to Weir village in Taunton, and in payment for land purchased or taken, for land damages and for rights and privileges of depositing material on land and flats on and adjoining that part of the river to be improved.

(5) No expenditure from the appropriation of $100,000 to be made until a project for the improvement of this river substantially as set forth in the report of the district engineer officer herein, shall have been adopted, and an appropriation made by Congress of such amount, in addition to the State's appropriation of $100,000, as will be required to carry out fully the project approved and adopted by the federal government.

(6) The construction of one or more public wharves on this river to be undertaken by the municipalities at their cost and expense; said wharves to be open to all users upon equal terms.

(7) The rebuilding of bridges and changes in existing bridges necessary to permit the passage of water craft in a channel 18 feet deep at mean low water, from Fall River to Weir village in Taunton, to be carried out by the municipalities or the authorized Board or officials, companies or corporations having control of the same, without cost to the Commonwealth.

In the opinion of the Board there is now necessity for legislation extending this Board's jurisdiction to the non-tidal part of Taunton River. Such extension of authority was made concerning the Connecticut River nearly thirty years ago.

This river above Weir village could be made of great commercial advantage to Taunton and the communities in that section of the State by the construction of a canal and lock at the dam in East Taunton, supplemented by dredging and the removal of obstructions which now prevent its use by all water craft except those of shallow draft. The transportation by water of coal, lumber, brick and other commodities to and from Fall River and beyond could, by means of an enlarged and deepened channel, with sufficient facilities for passing the above-named dam, be provided for at a cost which would be commensurate with the resultant benefits. Further advantages would follow the construction of a canal across country connecting the upper part of the Taunton River with North River and the sea, with Plymouth and with Brockton, thus providing an inland waterway from Narragansett Bay to Massachusetts Bay, an important link being a channel not less than 100 feet in width and not less than 18 feet deep at mean low water from Fall River to Weir village in Taunton, which this Board recommends.

Amount expended by the State during the year, $1,242.44.

Total amount expended by the State to Dec. 1, 1913, $1,653.06.

The total appropriations by the United States for Taunton River, to June 30, 1913, are $213,000, and the total expenditures, $200,243.68.

Vineyard Haven Harbor.

The improvement of this harbor by the Commonwealth was commenced in 1905. Since that time a stone breakwater 1,213 feet long has been constructed on the shoal ground on the westerly side of the harbor northerly of the steamboat wharf.

In August and September, 1913, a survey was made of the shoal lying between the red buoy off the breakwater and the steamboat wharf, and plans and specifications were prepared for improving this part of the harbor. On Oct. 27, 1913, a contract was entered into with Charles M. Cole to dredge a channel to the depth of 15 feet at mean low water between the red buoy named above and the steamboat wharf. The contract price was 29¼ cents per cubic yard, scow measurement.

Work commenced Nov. 21, 1913, and was substantially completed Dec. 1, 1913, material to the amount of 17,000 cubic yards having been removed.

Amount expended during the year, $131.71.

Total amount expended to Dec. 1, 1913, $30,363.57.

The total appropriations by the United States for Vineyard Haven harbor, to June 30, 1913, are $60,000, and the total expenditures, $55,387.35.

Wild Harbor.

Wild Harbor, Falmouth, is a small bay or cove on the easterly shore of Buzzards Bay, opening to the southwest. The mouth of the bay is so wide that practically none of the area suitable for the anchorage of boats is protected during the summer from the prevailing southwesterly winds.

Petitions for improvement have been presented and surveys and examinations made, but no work has been undertaken thus far by the Commonwealth, owing to the large cost involved.

A map of this harbor is printed with the report of the Board for 1907.

Total amount expended to Dec. 1, 1913, $100.27.

Witchmere Harbor.

Witchmere harbor, located at Harwichport, in the town of Harwich, is the home port for boats used as tenders for the lightships stationed on the shoals near Monomoy, and is the nearest point of safe anchorage for them.

Before 1899 the local authorities had made various attempts

to improve this harbor. Two wooden jetties were built at the harbor entrance, but these, while effective for a time, were soon destroyed by the combined action of storms, ice, and sea worms. A beginning had been made in the replacing of the wooden jetty on the western side of the harbor entrance by a stone jetty, but the means at the disposal of the town were not sufficient to extend this far enough to protect the entrance effectually.

From this lack of adequate protection resulted not only a constantly increasing shoaling of the harbor, but also an unpleasant sanitary condition that required immediate attention. The Board, therefore, under the provisions of chapter 463 of the Acts of 1899, prepared and carried out a modified plan of improvement, providing for the extension of the stone jetty on the westerly side of the entrance about 150 to 200 feet, and for building a timber jetty of oak piles and spruce lumber, about 250 feet long, on the easterly side of the entrance, parallel with and 100 feet easterly of the stone jetty; the outer end of the timber jetty to be strengthened by stone riprap.

This work was followed by building a timber bulkhead on the crest of the beach to prevent the driving of sand over the top of the jetty; by dredging the entrance channel to a width of 40 feet and to a depth of 5 feet at mean low water for a length of about 1,150 feet; by the dredging of a shoal within the harbor; by extending the westerly stone jetty; and by the placing of stone riprap on the banks of the entrance channel.

After these expenditures by the Commonwealth, fishermen using the channel and other citizens living in the vicinity cooperated to prevent injury to the entrance channel from the washing away of the beach at the inner end of the easterly timber jetty. To effect this protection they extended the easterly jetty into the bank, without expense to the Commonwealth.

In 1910, 1911 and 1912 petitions, under chapter 481 of the Acts of 1909, for further improvement of this harbor, were presented.

Following the building in 1911 of a concrete superstructure about two feet in height along the top of the jetty for a length

of 260 feet, a contract was entered into, on Sept. 18, 1912, with John R. Burke for dredging this harbor and also Herring River, Harwich, the work at Witchmere harbor comprising the dredging of a channel about 1,600 feet long, 60 feet wide on the bottom outside of the jetties, and 30 feet between the jetties, with an increased width in the harbor. This work was completed July 9, 1913, the contract price for this work and for dredging at Herring River, Harwich, being $13,700.

On April 16, 1913, a petition of the selectmen of Harwich for further improvement of this harbor was presented. Under contract of April 30, 1913, an area of about 1 acre in the southwesterly part was dredged to a depth of 5 feet at mean low water, the contract price being 30 cents per cubic yard for material removed and taken to sea. Work was completed May 26, 1913, at a total cost of $1,508.07.

Repairs have been made to the timber bulkhead on the easterly side of the harbor entrance at a cost of $15.10.

Contributions: —	
By the town of Harwich, 1904,	$500
By the town of Harwich, 1912,	500
Total,	$1,000

Amount expended during the year, $4,651.43.
Total amount expended to Dec. 1, 1913, $28,272.36.

Woods Hole Harbor.

Eel Pond Channel, Falmouth.

On Feb. 21, 1912, a petition of John J. Veeder, and others, under the provisions of chapter 481 of the Acts of 1909, for dredging a channel from Woods Hole Great Harbor to Eel Pond at Woods Hole in the town of Falmouth, was presented.

It appeared that an existing bridge, consisting of a stone arch structure, at Water Street, with a waterway 18 feet wide and a clear headroom at the center of the arch of about 5.3 feet above the level of mean high water, limited the passage of boats between the harbor and Eel Pond to those without masts and of small dimensions and draft; that the pond is a body of water of about 16.5 acres in extent, part of which pro-

vides a depth exceeding 8 feet, and used to some extent for the mooring of boats and as a place for hauling up and wintering; that the desired dredging should not be undertaken until the local authorities agree to rebuild this bridge with a draw for the passage of boats.

The town of Falmouth having made an appropriation, and this Board having considered an application for the necessary authority to rebuild this structure, a license therefor was granted on May 14, 1913, and an amount set aside from the funds at the Board's disposal to pay for the necessary dredging.

A project was prepared, and a contract entered into with the J. S. Packard Dredging Company on Aug. 6, 1913, calling for the dredging of a channel from Woods Hole Great Harbor to and into Eel Pond, 565 feet long, from 31½ feet to 36 feet wide, and 8 feet deep at mean low water.

The contract price is the lump sum of $6,500 for dredging and depositing the dredged material.

Work commenced Sept. 16, 1913, and was in progress on Dec. 1, 1913.

Contribution: —	
Private parties, 1913, ...	$1,500

Amount expended during the year, $3,032.87, which is the total amount expended to Dec. 1, 1913.

Under the heading "Woods Hole Channel" the United States Engineers report: —

Woods Hole Channel is a waterway or strait connecting Buzzards Bay and Vineyard Sound through the so-called "Great Harbor," lying near the southwestern part of Cape Cod, Mass. It is about 17 miles easterly from New Bedford and 6 miles northwesterly from Vineyard Haven. That part of the channel under improvement is 3,500 feet long and 300 feet wide with a branch channel, called "Broadway Channel" 1,300 feet long and 300 feet wide leading toward Vineyard Sound. Thirteen-feet draft can be brought into the main channel from the ocean. The mean range of the tide is 4 feet at the Buzzards Bay end of the channel and 1.65 feet at the Vineyard Sound end. Little Harbor lies to the east of Great Harbor and is separated from it by Parkers Neck.

Before improvement in the strait the channels were crooked and obstructed by bowlders, and the velocity of the currents at certain stages

of the tide was from 5 to 7 miles per hour. The site of the wharves and basins of the United States Fish Commission and Revenue-Marine Service was a submerged point of land from the shore of Great Harbor.

The original project of 1879 provided for making a channel through the bar at the entrance to Little Harbor and widening and deepening the channel through the strait. The project of 1883, extended in 1884 and 1886, provided for the construction of retaining walls on shore, a stone pier, and a wooden wharf, mainly for the use of the United States Fish Commission and incidentally for the use of other branches of the public service, all of which work had been completed prior to 1889.

The project of March 3, 1905, provided for widening and deepening the entrance channel to the wharf of the Lighthouse Establishment in Little Harbor, which was completed in 1905.

The amount expended on the original and modified projects prior to beginning operations on the existing project was $113,599.92, by which the entrance to Little Harbor had been dredged to 12 feet depth at mean low water and a width of 150 feet with a turning basin 300 feet wide in front of the wharf of the Lighthouse Establishment, and a direct channel 9 feet deep had been dredged through the strait. The retaining walls, stone pier, and wooden wharves at the United States Fish Commission had also been built and repaired.

The existing project, that of June 3, 1896, provides for deepening the channel through the strait to 13 feet at mean low water, and widening the same to 300 feet, with a branch channel of same dimensions leading from the strait toward Vineyard Sound; estimated cost, $396,000. The report on the survey upon which this project is based is printed at page 750 of the Annual Report of the Chief of Engineers for 1895.

No modification of the existing project has been made since its adoption.

The operations during the year have consisted in completing the removal of the points projecting above the level of 13 feet below mean low water through the central 100 feet of width of the main channel, clearing the same depth the 100 feet of width on the north side of the central sections, and starting work on the remaining 100 feet of width on the south side of the central section. Operations during the fiscal year have been for new work, for which $35,650.75 has been expended.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1913, exclusive of outstanding liabilities, was $208,620.90, resulting in the cutting of channels through the shoals, which are composed of large and small bowlders, and the final clearing out of all obstructions above the plane of 13 feet at mean low water in the northern 200 feet width of the main channel. All expenditures under the existing project, which is about 88 per cent completed, have been for improvement.

The maximum draft that can be carried over the shoalest part of the main channel is 10 feet at mean low water.

The length of the improved portion of the main channel is about 0.8 of a mile and of the Broadway Channel about 0.26 of a mile. The total commerce of Woods Hole amounts to 46,096 short tons, valued at $2,914,-025.50, consisting chiefly of coal, lumber, and other building materials, fish, and general merchandise. It is not known that any effect on freight rates has been produced by the improvement.

No account was kept of vessels passing through the strait and not stopping at Woods Hole.

It is proposed to expend the available balance in completing the straight channel from Buzzards Bay to Great Harbor.

For reference to reports containing more extended information see Annual Report of the Chief of Engineers for 1905, page 79.

Commercial Statistics.

The following statistics for the year 1912 relative to the commerce of the Woods Hole Channel, Mass., were compiled under the direction of this office from various available sources:

Season of navigation, year 1912, the entire year.

Vessel Classification.

Classes.	American.	Net registered tonnage.	Passengers.
Registered:			
Steamers	3,360	738,015	174,008
Sailing	331	8,370	1,026
Barges	7	2,450	–
Unregistered:			
Steamers	928	3,712	2,687
Sailing	745	2,235	1,360
Barges	15	2,625	–
Total	5,386	757,407	179,081

Included with "Registered steamers" are 1,335 steamers on regular lines, 548 Government steamers, 235 steam yachts and power freight vessels, 76 tugs, 146 fishing steamers, 1,020 small steamers and motor vessels.

Included with "Registered sailing" are 112 small freight schooners, 114 yachts, 105 fishing schooners.

Included with "Unregistered steamers" are 928 small motorboats.

Included with "Unregistered sailing" are 745 small sailboats.

Freight Traffic.

Articles.	Amount (customary units).	Amount in short tons.	Valuation.
Coal	7,319 short tons	7,319	$41,621 50
Oil	251,450 gallons	817	34,545 00
Lumber	1,629,000 feet b. m.	3,258	40,745 00
Shingles	852,000 pieces	106	3,408 00
Logs	700 pieces	450	3,500 00
Bricks	125,000 pieces	250	1,125 00
Stone	1,156 short tons	1,156	3,312 00
Other building material	475 short tons	475	3,325 00
Salt	136 short tons	136	1,088 00
Hay and feed	1,285 short tons	1,285	32,125 00
Grain	104,000 bushels	2,340	72,800 00
Live stock	462 head	231	69,300 00
Fertiliser	291 short tons	291	10,185 00
Other produce[1]	3,691 short tons	3,691	369,296 00
Manufactured iron and steel	185 short tons	185	13,500 00
Merchandise[2]	23,771 short tons	23,771	2,202,100 00
Miscellaneous[3]	335 short tons	335	12,050 00
Total		46,096	$2,914,025 50
Decrease under 1911		3,032	-

[1] Included with "Other produce" are 24,611 barrels of fish and shellfish.

[2] Included with "Merchandise" are 23,771 tons of freight not classified carried on regular steamer lines and sailing vessels.

[3] Included with "Miscellaneous" 150 cords of wood.

Local commerce is estimated as 16,693 tons, having an estimated value of $897,587.50. Commerce passing through Woods Hole Strait estimated as 29,403 tons, having an estimated value of $2,016,438.

Amounts appropriated.

Previous projects		$114,000 00
Existing project:		
June 3, 1896	$20,000 00	
Mar. 3, 1899	20,000 00	
June 13, 1902	20,000 00	
Mar. 3, 1905	70,000 00	
June 30, 1906	100,000 00	
		230,000 00
Total		$344,000 00
Dec. 5, 1895, unexpended balance deposited to the credit of the Treasurer of the United States		400 08
Total		$343,599 92

July 1, 1912, balance unexpended	$57,029 85
June 30, 1913, amount expended during fiscal year, for works of improvement	35,650 75
July 1, 1913, balance unexpended	$21,379 10
July 1, 1913, outstanding liabilities	3,527 05
July 1, 1913, balance available	$17,852 05
July 1, 1913, amount covered by uncompleted contracts	$16,550 00
Amount that can be profitably expended in fiscal year ending June 30, 1915, for work of improvement	[1]$25,000 00

The total expenditures by the United States for Woods Hole channel, to June 30, 1913, are $322,220.82.

The following is a statement of work done in rivers and harbors in addition to those specified on pages 6 to 114, including the protection of foreshores, from 1893 to Nov. 30, 1913, inclusive: —

ALLENS HARBOR, HARWICH.

Under the provisions of chapter 106 of the Resolves of 1908 a survey was made of Allens Harbor, and a possible plan for improvement at an estimated cost of $8,100 presented.

No work has been undertaken at this harbor.

A map of this harbor is printed with the report of the Board for 1908.

Amount expended to Dec. 1, 1913, $219.50.

APPONAGANSETT HARBOR.

Between 1902 and 1907 a stone breakwater 830 feet long, beginning at a point about 250 feet from the high-water line, with a width of 5 feet on top, and to an elevation of 6 feet above mean low water, was built at the entrance to Apponagansett harbor in the town of Dartmouth, to provide a safe anchorage for yachts and small craft, and four beacons placed on the breakwater, one at each end and two at equal distances between.

A map of this harbor is printed with the report of the Board for 1901.

Amount expended to Dec. 1, 1913, $40,222.87.

[1] Exclusive of the balance unexpended July 1, 1913.

Barnstable Harbor.

Under the provisions of chapter 106 of the Resolves of 1908 a survey was made of Barnstable harbor. A project was reported, but no work has thus far been done.

A map of this harbor is printed with the report of the Board for 1908.

Amount expended to Dec. 1, 1913, $217.51.

Bass River, Beverly.

Under a contract made in 1904 a channel 6,500 feet long was dredged to a width of 100 feet on the bottom, except through the ledge in the upper portion of Bass River, where the width was reduced to 75 feet and to a depth of 9 feet at mean low water. This dredging enabled vessels to reach the coal and lumber wharves in Beverly and the wharf of the United Shoe Machinery Company. For this work the Commonwealth expended $25,539.81 and the city of Beverly $55,535.75.

Total amount expended to Dec. 1, 1913, $81,075.56.

Concord River, Billerica.

On March 13, 1912, a petition of William J. Collins, and others, under the provisions of chapter 481 of the Acts of 1909, for the removal of rocks and certain shoals from Concord River in the town of Billerica, was presented. No conclusive action has been taken on this petition, owing to the lack of necessary funds.

Cotuit Harbor.

Stones and bowlders which obstructed the channel across the bar at the entrance to Cotuit harbor were removed in 1904, and in 1910 a channel across the bars at the entrance to the harbor was dredged to a width of 200 feet on the bottom and to a depth of 6 feet at mean low water.

Subsequently two shoals or bars in the channel near Bluff or Codmans Point were dredged at a cost of $4,166.61, completing the whole improvement.

A survey of the outer entrance channel made in October,

1911, showed that up to that time the channel had maintained its full width and depth.

A map of this harbor is printed with the report of the Board for 1911.

Contribution: —	
By private parties, 1910, ...	$2,000

Total amount expended to Dec. 1, 1913, $30,443.74.

Deacons Pond Harbor, Falmouth.

Under contracts made in 1908 and in 1911 two stone jetties were built at the outer end of the entrance channel to Deacons Pond harbor in the town of Falmouth; a channel from the sound into the pond dredged to a depth of 7 feet at mean low water, 150 feet wide on the bottom; an anchorage basin dredged to a depth of 7 feet at mean low water; and a shoal 400 feet long and 50 feet wide removed.

In 1909 and 1912 additional stone was placed in the westerly jetty.

A map of this harbor is printed with the report of the Board for 1911.

Contributions: —	
Town of Falmouth, 1909, ...	$10,000
Town of Falmouth, 1911, ...	2,000
Total, ...	$12,000

Total amount expended to Dec. 1, 1913, $45,557.61.

East Bay, Osterville.

Between 1899 and 1903 a channel for the passage of boats from Nantucket Sound into East Bay at Osterville, in the town of Barnstable, was dredged through the beach into the sound, and jetties built. In 1908 a channel was dredged to a width of 150 feet and a depth of 4 feet at mean low water, from the channel between the jetties into deep water on the northerly side of the bay; also a channel, 100 feet wide between the jetties and 4 feet deep at mean low water, into the sound.

In addition to repair work further dredging was done to enable boats to approach the public landing in the bay at all stages of the tide, a channel 200 feet long, 50 feet wide and about 4 feet deep at mean low water being dredged from deep water toward the shore at this landing.

In 1911 the westerly jetty was extended seaward 100 feet, and its outer end built up, 1,406.64 tons of stone being placed.

A map of this bay is printed with the report of the Board for 1911.

Total amount expended to Dec. 1, 1913, $22,937.54.

Essex River.

By chapter 125 of the Resolves of 1908 the sum of $5,000 was appropriated for the improvement of Essex River to be used in connection with one of a like amount by the United States government. The money appropriated by the Commonwealth was paid to the Secretary of War and the improvement carried out by the United States Engineers.

Total appropriations by the federal government to June 30, 1913, $30,000, and total expenditures, $30,000.

Green Harbor.

In 1896 this Board and the State Board of Health were constituted a Joint Board to investigate and report on conditions at Green harbor in the town of Marshfield. A report with certain recommendations for improvement was made in January, 1898. In 1899 and 1900 two stone jetties were built at a cost of $33,256.93, and a timber wall built to direct the current of Cut River.

A channel was dredged between the jetties to a depth of 5 feet at mean low water and to a width of 60 feet on the bottom, also an anchorage basin about 350 by 300 feet to the same depth as the channel.

Total expenditure to Dec. 1, 1913, $76,333.26.

Herring River Dike, Wellfleet.

The construction of a dike at or near the mouth of Herring River, in Wellfleet, was authorized by chapter 511 of the Acts of 1907. All work was completed May 24, 1910, and in Oc-

tober, 1910, the town of Wellfleet was notified that the dike and fishway were completed and that the town was authorized to maintain and operate the same, as provided in chapter 511 of the Acts of 1907.

Contribution:—
By the town of Wellfleet, 1908, ... $10,000

Total amount expended to Dec. 1, 1913, $21,800.73.

Housatonic River.

In 1912 a survey was made of this river extending from the Massachusetts-Connecticut line to the Sheffield upper covered bridge in the town of Sheffield, a distance of 12½ miles, under authority of chapter 110, Resolves of 1910, and chapter 111, Resolves of 1912.

Amount expended, $2,011.29.

Humarock Beach, Scituate.

It was estimated in 1909 that the cost of building a sea wall to protect that portion of this beach opposite the bridges, and extending about 2,000 feet north and 1,500 feet south of Sea Street, would be $24,600. No work in addition to the survey has been done.

Total amount expended to Dec. 1, 1913, $236.07.

Ipswich River.

A survey of Ipswich River was made in July, 1906, and a project prepared for such improvement as the limited appropriation permitted.

Under contract of Sept. 7, 1906, channels were dredged as follows: (1) at the inner bar at the mouth of the river, 600 feet long, 100 feet wide on the bottom and 6 feet deep at mean low water; (2) opposite the mouth of Neck Creek, 500 feet long, 60 feet wide on the bottom and 5 feet deep at mean low water; (3) from Horseshoe Curve to the southerly end of Old Maid's bank, about 1,900 feet long, generally 60 feet wide on the bottom and 5 feet deep at mean low water; and the channel of the river widened by dredging the southerly bank opposite Barras Banks for a length of 500 feet, to a width of 60 feet on the bottom and to a depth of 5 feet at mean low water.

In 1910 a petition, under the provisions of chapter 481 of the Acts of 1909, for further improvement of this river, was presented, and in 1911 a project was adopted for building a stone jetty on the southwesterly side of the river mouth. On April 14, 1911, a contract was entered into with Thomas Fitzgibbon for building this jetty, extending from the shore a distance of about 160 feet below high-water mark. The contract price was $2.43 per ton for stone furnished and placed.

Work under this contract has been abandoned owing to the objection raised by certain landowners with respect to title to a portion of the beach.

Further improvement of this river and the entrance thereto can be made only after a survey and investigation more extended than has yet been undertaken.

Contribution: —
Town of Ipswich, 1911, ... $1,000

Total amount expended to Dec. 1, 1913, $14,829.20.

Total appropriations by the United States, to June 30, 1913, $7,500 and total expenditures, $5,617.91.

Lake Anthony.

Lake Anthony is a body of water with an area of about 35 acres, situated in the town of Oak Bluffs. Before improvement it was connected with Vineyard Sound by a narrow outlet almost completely closed by sand driven into it by the sea. At its southern end was an area of about 14 acres, with a depth of over 5 feet at mean low water. To cut a channel between this deep-water area and the sound to afford a passage for boats and vessels of not less than 5 feet draft, and to deepen the lake, if necessary, to serve as a boat harbor, were the improvements authorized by the Legislature in 1898.

In 1899 an excavation was made through the beach, and the entrance channel protected by two stone jetties. Subsequently the jetties and the cut were repaired, an approach to the landing wharf was dredged, moorings placed and shoal places in the entrance channel dredged.

Further improvements were the widening of the harbor entrance and its deepening to 7 feet at mean low water, the deep-

ening of the anchorage basin to 6 feet at mean low water and enlargement of its area, and the protection of the jetties. The United States Lighthouse Department during 1901 placed two lights at the ends of the jetties.

A map of this harbor is printed with the report of the Board for 1911.

Contribution:—

Town of Oak Bluffs, 1911,	$2,000

Total amount expended to Dec. 1, 1913, $46,944.59.

North River.

The navigable portion of North River extends from North River bridge at Hanover to the sea, a distance of about 12 miles. Before improvement the channel for about two-thirds of this distance was obstructed by bowlders, and at one point, near the village of Norwell, by a ledge extending across the river.

Under contract of April 14, 1911, the channel was cleared of bowlders for a width of not less than 100 feet the whole distance from the landing at Hanover to the sea. The total cost of the work was $4,879.61.

In the opinion of the Board further appropriations by the State for the improvement of North River are necessary and desirable.

Contributions:—

Town of Norwell, 1911,	$500 00
Town of Marshfield, 1911,	500 00
Town of Pembroke, 1911,	300 00
Town of Hanover, 1911,	500 00
Total,	$1,800 00

Total amount expended to Dec. 1, 1913, $5,432.08.

Oak Bluffs.

In 1908, under authority of chapter 104 of the resolves of that year, certain rocks near the outer end of a public pier at Oak Bluffs, which obstructed the approach of boats thereto, were removed at a cost of $462.50.

Total amount expended to Dec. 1, 1913, $462.50.

Penikese Island.

Under authority of chapter 118 of the Resolves of 1908 the Board built at Penikese Island, in extension of the stone wharf on the easterly side of the main part of the island, a pile wharf 200 feet long, 20 feet wide, with an ell at the outer end 42 by 30 feet. After its completion on Jan. 2, 1909, the wharf was turned over to the State Board of Charity as required by the resolve.

In 1909 the Board, as directed by chapter 93 of the resolves of that year, made a survey of the entrance to Penikese Island and a report with estimate of cost of dredging a channel not less than 150 feet wide and 12 feet deep at mean low water from the wharf built by the Commonwealth to the channel between Cuttyhunk and Penikese islands.

Total amount expended to Dec. 1, 1913, $5,192.95.

Plum Island River.

Plum Island River is a narrow channel or strait in Newbury and Newburyport, connecting the head of Plum Island Sound with the Merrimac River near its mouth.

Under authority of chapter 106 of the Resolves of 1908 a survey was made in that year, and a project for improvement reported.

No appropriation other than that for a survey has been made and no work undertaken.

A map of this river is printed with the report of the Board for 1908.

Total amount expended to Dec. 1, 1913, $983.31.

Quansett Harbor, Orleans.

Quansett harbor is a small cove or basin in the northerly shore of Pleasant Bay, between the towns of Orleans and Chatham. The harbor is oval, about 800 feet long and 400 feet wide, with an entrance about 130 feet wide between low-water lines.

It was estimated in 1908 that the cost of dredging a channel through the harbor entrance to connect deep water in the bay with deep water in the harbor would be $6,600. No work has been undertaken.

A map of this harbor is printed with the report of the Board for 1908.

Total amount expended to Dec. 1, 1913, $194.50.

Quicks Hole.

In pursuance of the requirements of chapter 25 of the Resolves of 1903 a preliminary examination was made as to the expediency of constructing a harbor of refuge for fishing boats and small yachts on the westerly side of Quicks Hole in the town of Gosnold by excavating a channel into the pond at the northwesterly end of Nashawena Island.

After examination and a consideration of the conditions it was reported that it was not deemed expedient to make either a survey or estimate of cost of a harbor of refuge at this place.

No expenditure was made.

Revere Breakwater.

By chapter 108 of the Resolves of 1905, and chapter 99 of the Resolves of 1906, the sum of $55,000 was made available for the construction of a breakwater north of Cherry Island bar and east of Eliot Circle in the town of Revere.

In 1909 the work which had been completed under contract consisted of the shore arm of the breakwater, 361 feet in length, 910 feet in length of the main breakwater, and a beacon of large stones projecting well above the general level of the top of the main portion of the structure. In addition, Half Tide Rock and several bowlders near it which obstructed the basin had been removed.

In 1912 a portion of this breakwater was built up and repairs made extending from the northerly end of the structure south about 800 feet. Under the contract, which was made by authority of chapter 481 of the Acts of 1909, stone to the amount of 2,801 tons was placed in the structure and the beacon at the outer end.

The total cost of the work under this contract was $5,407.09.

Total amount expended to Dec. 1, 1913, $60,397.93.

Rockport Harbor.

In 1908 rocks projecting above the bottom over an area on the northerly side of Rockport harbor between the new wharf, so called, and Bear Skin Neck breakwater were removed.

Total amount expended to Dec. 1, 1913, $7,319.70.

The total expenditures by the United States to June 30, 1913, are $22,000.

The selectmen of Rockport have addressed the following letter to the Board concerning improvements of this harbor: —

Rockport, Mass.

What is needed more than anything else is the widening of the channel by dredging, so that the larger fishing vessels can get up to the wharves, which they cannot do under present conditions.

Rockport is the logical harbor for the "Ipswich Bay" fishing fleet. It is here that the small boats come to dispose of their catch. The other class of boats (vessels) are either obliged to make Portsmouth, N. H., or Gloucester, Mass. This takes many hours of valuable time, whereas if they could run up to the wharves in Rockport, all this time would be saved, thus enabling them, when conditions are favorable, to make two trips a day to our port instead of one.

A fisherman works hard for what he gets. There are not too many pleasant days in a year in which he can pursue his calling, therefore every trip counts.

In addition to dredging there are also two bowlders near the entrance of the harbor which are dangerous to navigation. These ought to be removed. In your annual report and recommendations to the next or incoming Legislature we would ask that the matters to which we have called your attention be duly considered.

Yours very truly,

Board of Selectmen,
John H. Dennis,
Chairman.

Scituate Sea Walls.

The protection of the shores and harbor of the town of Scituate was authorized by chapter 434 of the Acts of 1900. Work has been done as follows: —

A sea wall 998 feet long was built at the Sand Hills, along the crest of the narrow beach between Scituate harbor and the ocean. Completed in December, 1900.

A concrete sea wall, about 1,450 feet in length, along the

crest of the beach, between Damons Island and the Glades at North Scituate.

Granite masonry wall, 357 feet long, in front of the Cliff House, North Scituate.

Concrete wall, 356 feet long, near Surfside Road. Completed July 25, 1907.

Concrete wall, 700 feet long, between First and Second Cliffs. Completed July 25, 1907.

Stone riprap protection at the bluff at the southerly end of Third Cliff.

Two sections of sea wall at North Scituate, one along the beach south of Beach Street, the other in extension southerly of the wall near Surfside Road. Completed June 15, 1908.

Concrete sea wall at North Scituate Beach in the gap between the wall built by the Commonwealth in 1908, extending southerly from Beach Street, and the wall built by private individuals near Surfside Road. Completed Oct. 28, 1909.

In 1910 some of the work which was damaged by the great storm in 1909 was repaired.

Total amount expended to Dec. 1, 1913, $39,621.21.

Scorton Harbor.

Scorton harbor is formed by Scorton River, a small stream in the northwesterly portion of the town of Sandwich. This river, draining an area of about 500 acres of salt marsh and creeks, empties into Massachusetts Bay through a sand beach. In 1898, before improvements were commenced by the Commonwealth, this outlet shifted continually from west to east.

Dredging has been done through the beach to provide a channel and fixed outlet for the river, a stone jetty built and the channel protected by stone riprap. In 1911 the jetty was extended.

Contribution:—
Private individuals, 1911, ... $500

Total amount expended to Dec. 1, 1913, $17,774.34.

Sesuit Harbor.

Sesuit harbor at East Dennis is at the mouth of a small creek emptying into Cape Cod Bay. Before improvements by the Commonwealth were commenced, in 1908, the harbor had been shoaled by sand washed in by the sea and driven from the beach at the east by the northeast winds through the break in an old jetty built in 1851.

A stone jetty 700 feet in length was built in 1909 and was extended about 300 feet in 1910.

A map of this harbor is printed with the report of the Board for 1907.

Contribution: —

Town of Dennis, 1910, ... $1,000

Total amount expended to Dec. 1, 1913, $20,466.30.

Stage Harbor, Chatham.

By chapter 47 of the Resolves of 1903 the Board was authorized to build a timber dike and structures to close the breach at the eastern end of Stage harbor, Chatham, to protect the harbor from encroachments and damage by the sea.

In 1905 a timber dike was built across the channel through the marsh into the eastern end of the harbor; the structure extended across the marsh to the sand dunes on each side, and timber fences supported by embankments of sand were built for the purpose of closing the valleys through the sand dunes to the south of the main dike.

Subsequently additional structures were built and work done to repair and protect the dike.

Total amount expended to Dec. 1, 1913, $9,231.93.

The following letter received by the Board explains improvements desired at present at Stage harbor: —

. . . A portion of Stage harbor which would make a safe harbor of refuge for the many boats employed in the shellfish industry, if it could be dredged out, would be of great benefit, especially in the winter when ice is running; the estimated cost of the dredging referred to would be about $5,000. . . .

Very respectfully yours,

Joshua A. Nickerson,
Chairman.

Taunton River and Boston Harbor Canal.

Under the provisions of chapter 104 of the Resolves of 1901 the Board made surveys and estimates as to the probable cost of constructing a ship canal from Narragansett Bay, through Taunton, Brockton and Weymouth, to Boston harbor by way of Weymouth Fore River, and reported thereon to the Legislature on Dec. 1, 1901.

A map showing the proposed location of this canal is printed with the report of the Board for 1901.

Total expenditure to Dec. 1, 1913, $9,932.75.

Waquoit Bay.

Waquoit Bay, located in the southeastern portion of the town of Falmouth, in 1900 emptied at its southern end into Nantucket Sound through an opening about 250 feet wide.

Under authority of chapter 42 of the Resolves of 1900 a survey of this bay was made, and projects for its improvement and estimates of cost prepared.

It was reported that while the carrying out of any one of these projects would undoubtedly increase the use of the bay, the public advantage could hardly be deemed commensurate with the cost. No further appropriations have been made and no work of improvement undertaken.

A map of this bay is printed with the report of the Board for 1900.

Total amount expended to Dec. 1, 1913, $701.61.

Watch Hill, Chatham.

Under authority of chapter 126 of the Resolves of 1909 the Board prepared and carried into effect a project providing for the protection of the shore line and bluffs in the vicinity of Hotel Mattaquason, and for placing granite quarry grout and chips on the easterly side of Watch Hill and the low bluff stretching northerly from this point in front of said hotel. The work was completed in December, 1909.

Total amount expended to Dec. 1, 1913, $14,968.75.

West Bay, Osterville.

Work at West Bay, Osterville, in the town of Barnstable, was commenced by the Harbor and Land Commissioners under authority of chapter 483 of the Acts of 1897.

Up to 1901 a channel 100 feet wide and 3 feet deep at mean low water had been excavated from Vineyard Sound into and through South Bay to a point where there was a depth of 3 feet of water at mean low tide. This cut was protected by the erection of two timber jetties. Subsequently the jetties were strengthened with stone riprap.

Between 1901 and 1907 protective and repair work was done and dredging in the channel from the sound to the bay, resulting in a channel width of not less than 100 feet, a width of 150 feet through the higher portion of the shoal, and a depth of not less than 4 feet at mean low water throughout the length of channel.

Between 1907 and 1910 the existing westerly jetty was removed, a stone one built farther west, the easterly jetty strengthened and improved, and the channel between the jetties and in the bay dredged.

In 1911 the easterly jetty was reconstructed.

A map of this Bay is printed with the report of the Board for 1911.

Total amount expended to Dec. 1, 1913, $45,423.45.

West Falmouth Harbor.

A survey of the channel of the harbor at West Falmouth and a report with estimates of cost of dredging were made by the Board in accordance with the provisions of chapter 31 of the Resolves of 1906. Up to January, 1908, a channel 50 feet wide on the bottom and 6 feet deep at mean low water had been dredged from deep water west of Abbott's Point to the town landing.

Under contract made in 1908 a channel 50 feet wide and 6 feet deep at mean low water was dredged through the bar at the entrance to the harbor; an anchorage basin 300 feet wide, 350 feet long and 6 feet deep at mean low water, between Abbott's Point and the town landing dredged; and the angle

in the channel opposite Abbott's Point rounded off and dredged to a depth of 6 feet at mean low water.

In 1909 and 1910 the channel at the entrance to the harbor was widened 50 feet, the anchorage basin east of Abbott's Point extended toward the public landing, and an anchorage basin dredged on the southerly side of the channel east of Chappoquoit Island. All dredging was to a depth of 6 feet at mean low water.

Total amount expended to Dec. 1, 1913, $24,386.18.

In the various rivers and harbors that follow little or no work of improvement has been undertaken by the Commonwealth, but the need for such work is evident and the public demand for it in some cases urgent: —

Edgartown Harbor.

No expenditures have been made by the Commonwealth for work in Edgartown harbor, but conditions there make some improvements desirable.

The following letter suggests work at this place: —

The Board of Selectmen would suggest: —

1. The elimination of what is known as the middle ground, lying southeast of the black and red spar buoy in the inner harbor, so as to produce a better anchorage.

2. The removal of the bar extending across the entrance to the harbor from the red spar buoy No. 6, off Edgartown lighthouse in a southeasterly direction, to the shore of Chappaquidick Island.

The water in the harbor generally is of such good depth that the dredging suggested is all the more necessary, as will be clearly seen by reference to the United States Coast and Geodetic Survey chart of Edgartown.

Respectfully,

Selectmen of Edgartown,
By Francis A. Foster.

Up to June 30, 1913, the federal government had expended in Edgartown harbor the sum of $25,000.

In the opinion of the Board an appropriation by the State for the improvement of Edgartown harbor is necessary and desirable.

Fall River Harbor.

This harbor and the extensive and valuable harbor frontage, notwithstanding their importance as bearing upon the commercial prosperity of the city of Fall River and that section of the State, have not received as yet that consideration by the Commonwealth which has been accorded some of the other important harbors of the State. Improvement of channels and the construction and equipment of a public pier and dock are necessary, and were advocated by city officials and many citizens before a committee of the last General Court. The request for State assistance was based upon statistical data carefully collected by the Chamber of Commerce and others, showing the amount and character of business carried on, and the importance of providing ample means and facilities for water transportation as well as rail, and for a public terminal on the water front. The construction by the State or municipality of a public wharf in connection with improved channels to be provided by the federal government in various rivers and harbors is recognized as of so much importance that the adoption by the government of a project has in several instances been conditional upon the building of such structure. This policy, which appears to include co-operation by the State in appropriating a sum sufficient to pay a part of the cost of dredging, as exemplified in the case of Plymouth harbor, raises some new questions for consideration by the Legislature. The commercial standing of Fall River, capital invested, etc., are indicated as follows, and shown in official reports: —

Population in 1900, United States Census,	104,863
Population in 1910, United States Census,	119,295
Total valuation of assessed estates April 1, 1913,	$99,880,768 00
Number of establishments,	222
Capital invested,	$88,140,549 00
Value of stock and materials used,	$36,699,882 00
Amount of wages paid during year,	$15,724,515 00
Wage earners employed,	36,793
Value of product,	$62,440,525 00
Gross value of imports for fiscal year ending June 30, 1913,	$238,918 00
Receipts on imports for fiscal year ending June 30, 1913,	$50,481 61

In order that the work which the federal government has done in this harbor, and that which is projected may be shown, extracts are made from the report of the Chief of Engineers, U. S. A., for 1913: —

Fall River lies at the mouth of Taunton River, in the northeastern angle of Mount Hope Bay, which empties into the ocean through Narragansett Bay and Sakonnet River. It forms the port of entry of the city of Fall River, the largest cotton manufacturing city in the United States.

Before improvement the depth of water in the re-entrant in the wharf line north of the Old Colony Steamboat Co.'s wharf was only about 6 feet, and a considerable area of the harbor, especially in the front of the upper wharves, carried much less depth of water than existed in its approaches.

The harbor is about 2 miles long, with a width of from one-fourth mile to 1 mile. It is about 23 miles to the southeast from Providence and about 18 miles northerly from Newport Harbor.

Twenty-five feet can be brought into the harbor from the ocean. The mean range of tide at the entrance and within the harbor is 4.7 feet.

The project of 1874 provided for deepening an area in front of the wharves immediately north of the Old Colony Steamboat Co.'s wharf 160 feet wide to 12 feet, and an additional width of 100 feet to 11 feet at mean low tide. This improvement was completed in 1878 at a cost of $30,000.

The project of 1899, enlarged in 1902, provided for a channel 300 feet wide and 25 feet deep at mean low water along the city front between the Old Colony wharf and deep water at the upper end of the city front; also a channel of the same dimensions through Mount Hope Bay to connect the deep water in front of the city with the deep water of Narragansett Bay. This project was completed in 1907 at a cost of $175,412, since which date $20,009.51 has been spent for maintenance, making the total cost prior to beginning work on the present project $225,421.51.

The existing project, adopted by the river and harbor act of June 25, 1910, is based on the report of a survey printed in House Document No. 778, Sixty-first Congress, second session, and provides for the removal to a depth of 25 feet at mean low water of a shoal occupying a central position in the harbor and extending the area of that depth to the harbor line along the eastern side of the harbor at an estimated cost of $143,000, with $6,000 annually for maintenance.

No modification has been made in the existing project since its adoption.

The operations of the past fiscal year have consisted in dredging on the shoal in the central part of the harbor with the U. S. dredge *Gedney*, with the result that the minimum depth has been increased from 19.3 to 24 feet. This minimum depth is on a small shoal spot about 400 feet off the Old Colony Wharf and was of too hard material to be removed by a suction dredge. With this exception, the area now has the full

depth of 25 feet. There is yet to be dredged, in order to complete the project, a strip 50 to 250 feet wide, lying along the eastern harbor line from the Staples Coal Co. Wharf to the Slades Ferry Bridge, containing about 300,000 cubic yards. The shoalest water in this strip is 6.7 feet. Specifications for this remaining dredging have been approved and the work advertised. All operations have been confined to new work.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1913, exclusive of outstanding liabilities, was $92,393.12.

About 65 per cent of the existing project had been completed up to June 30, 1913.

The commerce using Fall River Harbor during the year 1912 amounted to 1,166,652 short tons, valued at $48,777,452.53, consisting of coal, cotton, general merchandise, fish, and shellfish. This includes about 113,834 tons of freight passing into or leaving Taunton River.

So far as known, no effect has been produced on freight rates by the improvement. It is proposed to apply the amount estimated as a profitable expenditure during the fiscal year ending June 30, 1915, to maintenance dredging to 25 feet in the approach channel and in the harbor if necessary.

Commercial Statistics.

The following statistics for the year 1912 relative to the commerce of the harbor at Fall River, Mass., were compiled under the direction of this office from various available sources.

Season of navigation, year 1912, the entire year.

Vessel Classification.

Classes.	American.	Foreign.	Total.	Net registered tonnage.	Passengers.
Registered:					
Steamers	3,411	–	3,411	1,871,676	355,344
Sailing	195	20	215	38,281	–
Barges	867	–	867	513,759	–
Unregistered:					
Steamers	7,705	–	7,705	23,115	15,000
Sailing	245	–	245	780	500
Barges	4	–	4	400	–
Total	12,426	20	12,446	2,448,011	370,844

Included with "Registered steamers" are 1,244 steamers on regular lines, 1,247 tugs, 83 large freight motor boats, 6 steam yachts, 632 oyster boats, 84 steam lighters, 11 Government steamers, 42 fishing steamers, 46 excursion steamers, 16 steamers.

Included with "Registered sailing" are 212 large freight schooners, 1 brig, 1 brigantine, 1 tern.

Included with "Unregistered steamers" are 7,705 small motor boats.

Included with "Unregistered sailing" are 245 small sailboats.

Included with "Unregistered barges" are 4 freight lighters.

Freight Traffic.

Articles.	Amount (customary units).	Amount in short tons.	Valuation.
Coal	658,046 tons	737,011	$2,596,981 49
Oil	4,803,188 gallons	16,555	387,035 38
Cotton	103,315 bales	25,829	5,424,090 00
Lumber	11,436,517 feet	4,050	274,911 96
Shingles	3,780,000	869	13,230 00
Logs	1,000 tons	1,120	8,000 00
Ties	7,639	360	4,965 35
Bricks	1,393,000	3,134	8,199 55
Cement	4,100 barrels	820	5,617 00
Stone	5,000 tons	5,000	10,000 00
Sand and gravel	5,800 cubic yards	8,700	9,850 00
Other building materials[1]	1,339 tons	1,339	15,359 50
Live stock	490 head	249	98,000 00
Fertilizer	300 tons	300	8,825 00
Other produce[2]	154 tons	154	7,700 00
Manufactured iron and steel[3]	564,000 pounds	282	7,053 30
Merchandise[4]	302,177 tons	302,177	35,917,700 00
Miscellaneous[5]	58,749 tons	58,749	3,979,934 00
Total		1,166,652	$48,777,452 53
Decrease under 1911		111,129	–

[1] Included with "Other building materials" are 1,669,600 laths, 9,980 bags plaster, 1,690 barrels lime, 1,900 rolls roofing paper, and 183 barrels pitch.

[2] Included with "Other produce" are 770 barrels of fish.

[3] Included with "Manufactured iron and steel" are 25 sheets roofing metal, 3,725 pounds of track material, and 280 tons pipe.

[4] Included with "Merchandise" are 302,177 tons of freight not classified, carried on regular steamer lines.

[5] Included with "Miscellaneous" are 7,700 empty barrels, 24 tons of telephone line supplies, 119 telephone poles, 478,000 fire bricks, 4,600 tons of fire clay, 533 barrels of stove lining, 400 tons moulding sand, 12,900 cords of wood, 4,118 bales of cotton waste.

The above figures include 113,834 tons, having a value of $482,167.93 to and from Taunton River, and passing through Fall River Harbor, Mass.

Amounts appropriated.

Previous projects, as shown in H. Doc. No. 421, 57th Cong., 2d sess.		$30,000 00
Existing projects:		
Mar. 3, 1899	$20,000 00	
June 13, 1902	38,000 00	
Mar. 3, 1903	117,412 00	
Mar. 3, 1905 (allotted Sept. 30, 1909)	500 00	

Existing projects — *Con.*		
Mar. 3, 1909 (allotted Dec. 21, 1909)	$20,000 00	
June 25, 1910	143,000 00	
		$338,912 00
Total		[1] $368,912 00
Received from sale of material		18 35
		$368,930 35
July 1, 1912, balance unexpended		$87,206 45
June 30, 1913, amount expended during fiscal year, for works of improvement		36,091 24
July 1, 1913, balance unexpended		$51,115 21
July 1, 1913, outstanding liabilities		1,765 08
July 1, 1913, balance available		$49,350 13
Amount that can be profitably expended in fiscal year ending June 30, 1915, for maintenance of improvement		[2] $12,000 00

The total expenditures by the United States, up to June 30, 1913, for Fall River harbor are $317,814.63.

The needs and requirements of Fall River have been expressed in the following letters: —

FALL RIVER, MASS.

The pressing and vital need of the harbor of Fall River for the benefit of its commerce and industry is a public water terminal conveniently located for both local business and through shipments to other places. The city of Fall River already owns a public municipal dock on Davol Street of 113 feet, extending 760 feet out into the harbor, but the extreme end of the pier is only a width of 62 feet. In order to secure necessary berthing space for desirable steamship lines the land to the south adjoining the present municipal dock, and extending to the Staples Coal Company's property, should be acquired. This would secure a frontage on Davol Street of 785 feet, and by extending it to the harbor line a distance of about 300 feet beyond the present municipal dock would give a dock of about 600,000 square feet in area, and with berthing slips of sufficient length and width would accommodate three steamship lines and local commerce, both steam and sail. On this municipal dock should be erected fireproof freight sheds with modern electric cranes for the quick unloading of vessels. Each freight shed should be connected by spur tracks to the main line of the New York, New Haven & Hartford Railroad Company at Davol Street at the most convenient location. The desirability of acquiring and developing this property for a public municipal water terminal has already been recommended by Col. J. C. Sanford, U. S. A. Engineer, in his report to the 61st Congress, Document

[1] Unexpended balance of 51 cents returned to United States treasury.

[2] Exclusive of the balance unexpended July 1, 1913.

778, pages 12, 13 and 14, on March 12, 1910, on the harbor of Fall River. The desirability of harbor improvements by the construction of this public water terminal has also been recommended by the Fall River Chamber of Commerce, by officials of the Fall River Cotton Manufacturers Association and the Fall River Merchants Association.

Yours truly,

JAMES H. KAY,
Mayor.

FALL RIVER, MASS.

In regard to the harbor of Fall River permit me to state that the most pressing need for its development is a public water terminal. The government has spent $368,930 in dredging a 25-foot channel to the deep waters of Mount Hope Bay and in providing an anchorage opposite the city with a minimum depth of water of 25 feet, giving us an area about 1½ miles long and about 1 mile in width; and in order to co-operate with them and utilize the work they have done and receive further government appropriations it is necessary that a public terminal should be built so that new steamship lines would be attracted to our city and our commerce largely increased by this improvement. During the past two months Providence has received by water cotton to the value of about $5,000,000, which has been used largely by Massachusetts corporations. With a public water terminal at Fall River this merchandise for Massachusetts corporations would be received at a Massachusetts port instead of increasing the commerce of a rival State.

The city of Fall River already owns a public municipal dock on Davol Street, but it has no railroad connections and is inadequate as to size, having a frontage on Davol Street of 113 feet and extending out into Taunton River a distance of 760 feet with a width at the extreme end of 62 feet. In order to secure space for a wharf of sufficient size, the property to the south of the municipal dock, extending to the property of the Staples Coal Company, should be acquired and the whole width of about 800 feet on Davol Street should be carried out to the harbor line, which is about 300 feet from the end of the present municipal dock. This would give a dock of about 600,000 square feet in area which would permit the construction of slips of sufficient length and width to accommodate the necessary steamboat lines both foreign and local, and also allow space for the handling of the present local commerce coming by steam and sail. On the dock alongside the slips modern fireproof freight sheds should be erected with the most modern mechanical appliances for the quick loading and unloading of vessels, and each freight shed connected by spur tracks to the main line of the New York, New Haven & Hartford Railroad Company on Davol Street. The construction of the public water terminal has received the approval of all the newspapers in the city, of the Fall River Chamber of Commerce, of the Fall River Merchants Association and the officials of the Fall River Cotton Manu-

facturers Association, and also recommended in the government report of Colonel Sanford, United States Engineer, in his report to Congress on the harbor of Fall River, March 12, 1910.

Yours truly,

A. HOMER SKINNER.

FALL RIVER, MASS.

Fall River's most pressing need is a water terminal owned by the public and connected with the existing line of railroad to this port, so that steamers from all parts of the Atlantic coast and from abroad can be properly accommodated and Fall River given such a place among the commercial cities of the seaboard as its natural harbor facilities warrant. Under present conditions the advantage of cheaper transportation is forbidden by lack of such terminal, the control of all developed terminals being in the hands of one railroad.

An opportunity for the development of such a terminal is afforded by the city wharf which, with contiguous property, is available at a fair price. The cost of taking over the city wharf, obtaining said property and constructing enlarged docks with connection with the railroad is estimated at $750,000. The condition of the harbor is already such that the dredging in connection with the plan proposed would be of nominal cost. The harbor is reached by a 25-foot channel of 300 feet in width, leading from the lower harbor directly to a 25-foot anchorage basin. This was dredged by the national government, and there is specified an appropriation to maintain a channel by such work as may be necessary. The estimate covers warehouses, land for railroad approaches, etc.

Fall River further needs a breakwater and sheltered anchorage for small vessels upon the shore opposite the city, which is the territory of the town of Somerset. A pond known as Wilbur's Pond, separated from the bay by a narrow stretch of sand, offers itself as a logical and inexpensive situation for such a basin. The breakwater should run latitudinally across the western side of the harbor as a protection against the unrestricted sweep of strong winds directly up the bay. The estimated cost of this project is $40,000. Estimate covers cost of acquiring privilege of pond, dredging and erection of breakwater.

The national government has decided that no further expenditure shall be made for harbors where public terminal facilities are not afforded; hence progress in the development of Fall River's harbor now depends upon the above appropriations. The national budget for harbor development is large, demonstrating the nation's attitude in favor of harbor development. Fall River has received in the past but a moderate share of the appropriations to which it has contributed its proportionate share, and should in justice be afforded the means for availing itself of the opportunity provided by the national policy.

The possession of wharf property by the city provides an advantageous starting point for the development which is projected.

The annual tonnage of freight carried by a single line is set at 350,000 tons in and out of Fall River. Other lines carry a proportionate share. Three lines of steamers have announced themselves as likely to be interested in the maintenance of a public terminal at this port. Notice is constantly being received from coastwise transportation lines of service from other ports which they deem will be of value to Fall River shippers, but which they cannot bring nearer than certain specified ports because of lack of terminal facilities. Not only the heavy traffic of Fall River but that of the large contributory shipping territory from north and south will be benefited by better facilities at this port, which is appropriately called "the gateway of southern New England."

The need of Fall River's harbor is simple, the expense involved inconsiderable, in view of the advantage to be gained by a wide territory. This simple statement should suffice to leave it with whomsoever may be interested, upon its merits.

Very truly yours,

FALL RIVER CHAMBER OF COMMERCE,
By WILLIAM A. HART,
Secretary.

In the opinion of the Board an appropriation by the State for the improvement of Fall River harbor is necessary and desirable.

On Jan. 15, 1913, a petition of William S. Greene, and others, under the provisions of chapter 481 of the Acts of 1909 and chapter 642 of the Acts of 1912, for the construction of a breakwater in Fall River harbor off the South Somerset shore, was presented. A survey and estimate of cost of the work desired was subsequently made by the Chief Engineer. The location of the proposed breakwater is on the westerly shore of Fall River harbor, near the southerly side of a small tide-water pond, separated from the harbor by a narrow sand beach. It is also directly opposite the northerly end of the anchorage basin which the federal government is dredging in this harbor. It was estimated that the cost of the desired structure would be approximately $40,000. The large cost of the work, as well as certain questions arising in connection with its probable effect upon the current in Fall River harbor, has caused delay in arriving at a definite conclusion with respect to this petition.

Marion Harbor.

No expenditure has been made by the Commonwealth under the direction of this Board for the improvement of Marion harbor. The River and Harbor Act of Congress, approved March 4, 1913, authorized a preliminary examination of this harbor.

New Bedford and Fairhaven Harbors.

There has been no expenditure under the direction of this Board for the improvement of New Bedford and Fairhaven harbors for dredging or for the construction of any harbor works. The claims of New Bedford for appropriations by the State were urged before the Legislature of 1913 by its mayor and others, and bills providing for the appointment of a special commission and for an investigation of the possibilities of commercial and industrial development and navigation in and about the harbor were heard and considered by the committee on harbors and public lands. The importance of New Bedford, by reason of its location, its manufacturing and industrial establishments located near tide water, its extensive water front and the great advantages which it offers for a still larger commercial growth, calls for a careful consideration this year of its request for a share of the State's appropriations for rivers and harbors. The ownership and control by the municipality of four public wharves, with docks, is evidence of the farsighted and progressive policy of its citizens. The desire to provide deep channels of approach and terminals to meet the requirements of modern business methods is based in part upon the following statistics and data: —

Population: —	
1900,	62,442
1905,	74,362
1910,	96,652
Total valuation of assessed estates, April 1, 1913,	$104,536,328 00
Number of establishments,	168
Capital invested,	$84,465 350 00
Value of stock and material used,	$36,268,351 00
Amount of wages paid during the year,	$15,493,225 00
Wage earners employed,	32,031

Value of product,	$59,823,994 00
Value of merchandise imported at New Bedford from foreign countries during the fiscal year ending June 30, 1913,	$439,638 49
Value of merchandise exported in same period of time,	$58,806 00
Receipts from customs,	$42,764 13
Immigrants arrived,	1,318

The federal government's activities are shown in the report of the Chief of Engineers, U. S. A., for 1913: —

Harbors of New Bedford and Fairhaven, Mass. — New Bedford Harbor is an estuary of Buzzards Bay, at the mouth of the Acushnet River, the Fairhaven side of the harbor being called Fairhaven Harbor.

Before improvement the channel had a depth of 12.5 feet at mean low water.

The entire harbor extends in a northerly and southerly direction for about 5 miles. The upper 2 miles are about three-fourths of a mile wide and the lower 3 miles about 1⅞ miles wide. The northerly end narrows into the Acushnet River, which extends about 1½ miles farther north, when it becomes very shallow. The lower end opens into Buzzards Bay between Clark and Sconticut Points. A large portion of this area has very little depth. It is about 21 miles by water to Vineyard Haven Harbor, on the Vineyard Sound, in a southeasterly direction, and about 42 miles to Point Judith Harbor, to the westward. Twenty-five feet draft at mean low water can be brought into the harbor from the ocean through a channel 300 feet wide. The mean range of the tide at the entrance and within the harbor is 4.2 feet.

The improvement of this harbor has been carried on under a number of distinct projects. The projects of 1874 and 1877 provided for a channel 300 feet wide and 15 feet deep at mean low water from the deep water just above Palmers Island to the wharves of New Bedford. This work was completed in 1877 at a cost of $20,000. This was followed after 1887 by various projects in which the controlling depth was 18 feet at mean low water and comprised channels 200 feet wide from Buzzards Bay to New Bedford, about 150 feet wide along the city wharf front above and below the New Bedford and Fairhaven Bridge, an anchorage area about one-half mile long and 600 feet wide on the northerly side of the main channel between New Bedford and Fairhaven, and a channel 250 feet wide leading from the anchorage area through the draw in the bridge to the wharves above, with a turning basin above the bridge. The total cost of the 18-foot projects, which were completed in 1906, was $137,709, making a total cost of $167,709 expended prior to the adoption of the existing project.

The existing project was adopted by the river and harbor act of March 2, 1907. It provides for dredging channels 25 feet deep at mean low water, 300 feet wide from Buzzards Bay to the north end of Fish Island,

just above the New Bedford and Fairhaven Bridge, with a turning basin above the bridge, and an anchorage area of about 114 acres, 25 feet deep, between New Bedford and Fairhaven, at an estimated cost of $527,000. This project was modified by the river and harbor act of March 3, 1909, so as to include the extension of the basin above Fish Island southward between the harbor lines to the bridge between New Bedford and Fish Island and the extension of the 25-foot channel along the New Bedford front from its terminus under the 1907 project northerly between established harbor lines to said bridge. This modification was authorized provided it could be made within the limit of cost of the 1907 project.

The actual project with all modifications under which work is now in progress provides for a channel 300 feet wide from Buzzards Bay to the north end of Fish Island just above the New Bedford and Fairhaven bridge, with a turning basin above the bridge and an anchorage area of about 114 acres below the bridge between New Bedford and Fairhaven and extending to the harbor line on the New Bedford side, together with short channels above and below the bridge in the old passage between New Bedford and Fish Island connecting with the other areas now being dredged. All dredging under the project is to a depth of 25 feet at mean low water.

This project was modified by the river and harbor act approved July 25, 1912, in accordance with report printed in House Document No. 442, Sixty-second Congress, second session, which contemplates the extension of the channel up the Acushnet River from the upper anchorage basin to Belleville, 2.15 miles, on which part of the harbor no work has yet been done by the United States, the channel to be made 18 feet deep at mean low water, 100 feet wide at the bottom, with increased width at the bend below Coggeshall Street Bridge, and a turning basin about 300 feet wide at the upper end, at an estimated cost of $56,610, with $3,000 annually for maintenance, subject to the condition that local interests construct a new bridge at Coggeshall Street, with at least one draw opening of 100 feet, and the building of a substantial wharf by the city upon its property at Belleville. The full amount estimated above was appropriated by the said act.

Operations during the fiscal year of 1912 consisted in dredging the approach channel to its full width of 300 feet up to the north end of Palmers Island and there connecting with the anchorage area, about four-tenths of which was dredged.

During the past fiscal year dredging operations were confined to increasing the 25 foot deep anchorage area, widening the channel from the anchorage area to the turning basin above the bridge, and widening the short channel below the bridge between New Bedford and Fish Island.

On March 13, 1913, dredging was terminated, due to a lack of funds, and at the end of the fiscal year there was a channel 300 feet wide and 25 feet deep from Buzzards Bay to the anchorage area at the north end of Palmers Island. An anchorage area of 114 acres had been dredged 25 feet deep except over the ledge rock north of Palmers Island, where

the least depth is 15.5 feet. There also remains in the anchorage area a strip about 40 feet wide along the northwest side and some shoal spots that had not been cleaned up when work was stopped. The channel from the anchorage area through the draw of the bridge had been widened and made 25 feet deep except near the bridge, where it is 18 feet deep. The short channel from the anchorage area to the bridge between New Bedford and Fish Island had also been widened.

The ledge rock at the junction of the approach channel with the anchorage area near the north end of Palmers Island will have to be removed in order to complete the project, which work can not be accomplished within the originally estimated cost of the project. This additional work is necessary to make the improvement available and also for the extension of the benefits.

The expenditures made during the fiscal year, exclusive of outstanding liabilities, were $127,573.42 all of which was for new work.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1913, was $512,060.24, exclusive of outstanding liabilities, all of which was for new work.

The work was carried on under a continuing contract.

No work has been done on that portion of the project which contemplates the extension of an 18-foot channel up the Acushnet River to Belleville. The execution of this work is dependent upon the construction by the local authorities of a new bridge with wider draw and a wharf. The city authorities of New Bedford have decided not to take any action to conform to these conditions at present and have taken preliminary steps to repair the bridge, retaining present width of draw.

At the end of the fiscal year about 91 per cent of the general project had been completed and about 25 feet of water at mean low tide can now be carried from Buzzards Bay through the harbor to the drawbridge, about 3 miles. About 18 feet can be carried through the bridge, and 25 feet from the bridge through the turning basin, about 0.2 mile. A farther distance of about 2 miles up the Acushnet River is navigable, with a natural depth of from 6 to 15 feet of water. The work is still incomplete. The rock near the north end of Palmers Island, referred to above, is a particularly dangerous obstruction to vessels of heavy draft attempting to use the new channel.

The limiting depth of 18 feet at the New Bedford and Fairhaven Bridge is due to a city water pipe crossing the channel.

The commerce of the harbor in 1912 amounted to about 1,478,733 short tons, consisting mostly of coal, building materials, general merchandise, cotton, valued at $44,599,344.57.

The effect of the deep water on commerce is the use of deeper draft vessels than formerly, with larger cargoes. So far as is known, the project has had no effect on freight rates.

The amount estimated as a profitable expenditure for maintenance for the year ending June 30, 1915, is for maintenance of the approach channel and anchorage area.

Commercial Statistics.

The following statistics for the year 1912 relative to the commerce of Harbors at New Bedford and Fairhaven, Mass., were compiled under the direction of this office from various available sources.

Season of navigation, year 1912, the entire year.

Vessel Classification.

Classes.	American.	Foreign.	Total.	Net registered tonnage.	Passengers.
Registered:					
Steamers	6,999	3	7,002	1,286,029	251,437
Sailing	939	15	954	75,165	2,970
Barges	755	–	755	744,813	–
Unregistered:					
Steamers	5,990	–	5,990	23,960	6,000
Sailing	878	–	878	3,512	675
Barges	61	–	61	25,570	–
Total	15,622	18	15,640	2,159,049	261,082

Included with "Registered steamers" are 1,271 steamers on regular lines, 828 tugs, 181 Government steamers, 50 steam yachts, 63 freight steamers, 13 steam lighters, 3 foreign steamers, 6 fishing steamers, 4,587 large motor boats.

Included with "Registered sailing" are 130 large freight schooners, also whaling schooners and Portuguese packets, 6 barks, 3 brigs, 310 yachts, 505 fishing vessels.

Included in "Registered barges" are 743 large freight barges and 12 lighters.

Included in "Unregistered steamers" are 5,990 small motor boats.

Included in "Unregistered sailing" are 878 small sail boats.

Included in "Unregistered barges" are 10 dredges, 40 scows, 11 lighters.

Freight Traffic.

Articles.	Amount in customary units.	Amount in short tons.	Valuation.
Coal[1]	1,129,850.5 tons	1,129,850.5	$4,563,079 90
Oil[2]	4,372,057 gallons	16,190	605,118 08
Cotton	181,400 bales	49,885	15,945,400 00
Lumber	18,710,389 feet	41,179	404,810 11
Shingles	8,433,000	1,265	31,523 75
Logs	197	66	985 00
Ties	13,612	1,021	8,167.20
Brick	1,975,000	3,950	20,705 00
Cement	885 barrels	177	1,770 00
Stone	2,300 tons	2,300	2,875 00
Sand and gravel	540 tons	540	1,395 00

[1] Included in "Coal" are 350,000 tons of coal in barges and steamers anchored in New Bedford Harbor.

[2] Included in "Oil" are 936,232 gallons of whale and fish oil.

Freight Traffic — Concluded.

Articles.	Amount in customary units.	Amount in short tons.	Valuation.
Other building material	1,400 barrels	280	$3,300 00
Salt	46 tons	46	381 00
Hay and feed	1,825 tons	1,825	45,575 00
Grain	27,855 bushels	619	19,498 00
Live stock	1,850 head	705	302,075 00
Fertilizer	298 tons	298	10,728 00
Other produce[1]	11,596 tons	11,596	850,450 00
Manufactured iron and steel	1,274 tons	1,274	24,758 53
Merchandise[2]	212,887 tons	212,886	20,993,400 00
Miscellaneous[3]	2,780 tons	2,780	763,350 00
Total		1,478,733.5	$44,599,344 57
Increase over 1911		–	4,323,742 77
Decrease under 1911		85,174.5	–

Amounts appropriated.

Previous projects:		
As shown in H. Doc. No. 421, 57th Cong., 2d sess.		[4] $159,700 00
Mar. 3, 1905		11,000 00
Total		$170,700 00
Existing project:		
Mar. 2, 1907	$100,000 00	
May 27, 1908	200,000 00	
June 25, 1910	50,000 00	
Feb. 27, 1911	50,000 00	
Aug. 24, 1912	127,000 00	
		527,000 00
July 25, 1912		56,610 00
Total		$754,310 00
Received from sale of material		41 28
		$754,351 28
July 1, 1912, balance unexpended		$15,545 46
Amount appropriated by river and harbor act approved July 25, 1912		56,610 00
Amount appropriated by sundry civil act approved Aug. 24, 1912		127,000 00
		$199,155 46

[1] Included in "Other produce" are 8,558,000 pounds of fish and 26,000 barrels of shellfish.

[2] Included in "Merchandise" are 215,633 tons of freight, not classified, carried on regular steamer lines.

[3] Included in "Miscellaneous" are 750 tons of automobiles and vehicles.

[4] Includes item of $3,000 appropriated Aug. 30, 1852, for survey of Taunton River and New Bedford Harbor.

June 30, 1913, amount expended during fiscal year, for works of improvement	$127,573 42
July 1, 1913, balance unexpended	$71,582 04
July 1, 1913, outstanding liabilities	2,613 34
July 1, 1913, balance available	$68,968 70
Amount (estimated) required to be appropriated for completion of existing project	$57,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1915, for works of improvement and for maintenance	[1] $67,000 00

[1] The total expenditures by the United States, to June 30, 1913, for New Bedford and Fairhaven harbors are $679,769.24.

The city of New Bedford, by its mayor, in a letter to this Board dated Dec. 8, 1913, states: —

The city should have at least one pier equipped with every modern facility for rapid discharging and loading of vessels of at least 25-foot draft, with special regard to the receipt of cotton in large carriers. This pier should be so built that the depth of water in the berths can be increased to 30 feet at mean low water when that depth is provided in the channel by the federal government. This pier should also have an adequate cotton warehouse for the storage of cotton pending shipment to its ultimate destination. A cargo of cotton on a 25-foot draft is over 5,000 bales, which is a very large amount of cotton to be handled promptly by teams or by rail, even if its final destination is known at the time of its arrival. The mills of Massachusetts need a distributing center for cotton, and New Bedford meets the required conditions as it is connected by rail with all the consuming points, and is readily accessible to the regular deep-water cotton carriers. The city of Providence is making a strong effort to become such a center of distribution, as demonstrated by the large shipments of cotton that have been made to that city by water this fall.

New Bedford has built a pier with a building specially designed for the receipt of immigrants. As far as I know, it is the only one of its kind in New England that was built and paid for by a municipality. This pier, however, should be lengthened and the berths deepened to provide for the type of vessels that could come to New Bedford if the facilities were adequate.

We think the State should do this in view of all that the city has provided at its own cost, and in view of the fact that this particular business will not go to any other port in Massachusetts.

I also think that the State should provide a floating dry dock at New Bedford. It is the nearest deep-water port to the location of 75 per cent. of all the marine accidents that take place on the Massachusetts coast. It has the necessary shops and facilities for the operation of a dry dock.

[1] Exclusive of balance unexpended July 1, 1913.

All the traffic through the Cape Cod Canal will pass within 5 miles of the inner harbor of New Bedford. A floating dry dock can be built at very much less cost than a graving dock; it can readily be increased in size, and its location can be changed at small cost.

This is a brief statement of the improvements desired for the harbor of New Bedford that may properly be considered as worthy of the expenditure of Commonwealth funds. In my judgment they will not only bring new commerce to the State, but they will also reduce the cost of transportation to our manufacturing industries.

Respectfully yours,

CHAS. S. ASHLEY,
Mayor.

In the opinion of the Board an appropriation by the State for the improvement of New Bedford harbor is necessary and desirable.

NEWBURYPORT HARBOR AND MERRIMAC RIVER.

A survey and map of a part of the Merrimac River above the County bridge at Haverhill was made during the year in connection with the proposed construction of a wall on the south side of the river. Inspections have also been made to ascertain the location and extent of encroachments made without license.

Under the provisions of chapter 708 of the Acts of 1912 a special Board, the Merrimac Valley Waterway Board, was established for the purpose of making an investigation of this river, including a thorough survey and study of the possibilities of development of navigation and power.

This special Board has collected a vast amount of information which includes data concerning Newburyport harbor at the mouth of this river, and has set forth in its report (House Document, No. 2169) many data relating to the water front of Newburyport, terminal facilities, amount and character of business, etc., collected by the district engineer officer in connection with his preliminary examination of the Merrimac River under the provisions of the River and Harbor Act of Congress, approved July 25, 1912; also that officer's views as to the improvement of this harbor and the whole length of river to Lowell by means of a channel not less than 18 feet deep.

The chief of engineers reports that "June 30, 1913, the deep-

est draft that can cross the bar at the mouth of the river at mean low water under favorable conditions is 9 feet, but the usual draft is 7 feet, and this draft can be carried to the wharves at Newburyport, alongside some of which there is a depth of 12 to 15 feet at low water. The tidal range at the bar is 7.7 feet and at Newburyport, 7.6 feet."

Appropriations by Congress, from June 14, 1880, to March 4, 1913, inclusive, for the improvement of this harbor, aggregate $473,500. The expenditures to June 30, 1913, aggregate $441,320.18.

The existing project of the federal government, adopted in 1899, for the improvement of the Merrimac River, is to obtain a channel 7 feet deep at mean low water, 150 feet wide, from Newburyport, 16½ miles, to Haverhill. It is stated that this channel was completed in 1907, has since been maintained by redredging and removal of bowlders, and that the appropriations by Congress to June 30, 1913, for this river, aggregate $405,266.72. The expenditures to June 30, 1913, amount to $393,001.57.

There have been no expenditures by the State for dredging in Newburyport harbor or in Merrimac River. It may be noted in this connection that the jurisdiction of the Board of Harbor and Land Commissioners over the Merrimac River is confined to that part which is tidal. The nontidal portion, which extends from a point at Mitchells Falls above Haverhill up river, is without this jurisdiction. It seems necessary and advisable that action be taken by the Legislature at this session looking to the passage of an act providing for supervision and control over the nontidal part of the river similar to that now provided by law over the tidal portion.

The conclusions reached by the Merrimac Valley Waterway Board and its recommendation are: —

(*a*) That the Merrimac River should be improved and opened to navigation by providing a channel 18 feet deep at mean low water extending from the sea to Ward Hill, about 1 mile above Haverhill, and by providing a depth of 18 feet by means of a channel and by building canals and locks from Ward Hill to Hunts Falls at Lowell.

(*b*) That the federal government carry into effect a project providing for a channel 18 feet deep at mean low water, from the sea to Ward Hill about 1 mile above Haverhill, and that the Commonwealth of Massachu-

setts co-operate with the federal government in carrying such project into effect, the basis, form and method of co-operation to be agreeed upon after all facts and data have been obtained.

(*c*) That the Commonwealth of Massachusetts adopt and carry into effect the project prepared by the Merrimac Valley Waterway Board for the improvement of the Merrimac River from Ward Hill, about 1 mile above Haverhill, to Hunts Falls, at Lowell, substantially as outlined in this report, namely by excavating a channel of adequate width and 18 feet deep in the river, and by building locks and canals to provide a depth of 18 feet; and that the federal government co-operate with the Commonwealth of Massachusetts in carrying such project into effect, and that the basis, form and method of co-operation in respect to the State's project be agreed upon at the same time as agreed upon in respect to the federal government's project for improvement of the river as far as Ward Hill.

(*d*) That work under projects for improvement of the Merrimac River from the sea to Hunts Falls at Lowell be carried on progressively, upstream and in such manner and at such times as will insure the earliest possible completion of the projected channel as far as Lowell.

(*e*) That the Board of Harbor and Land Commissioners be given charge and jurisdiction over that part of the Merrimac River which is not tidal, substantially to the same extent as that Board's powers and duties now apply to tide waters; that said Board be authorized to continue the investigation thus far made by the Merrimac Valley Waterway Board, particularly with reference to that part of the river from Hunts Falls to the State line, and the location of terminals; to act in conjunction with the cities and towns in the Merrimac valley in the furtherance of such plans and projects for improving this river as it may deem worthy; and to have charge of and supervise all works of improvement.

(*f*) That the Legislature memorialize Congress to take early and favorable action looking to the improvement of the Merrimac River and its opening to navigation from the sea to Lowell, urging that appropriations be made to carry out the necessary work in co-operation with the Commonwealth of Massachusetts.

(*g*) That an appropriation of $1,000,000 be made by the Legislature for the purpose of improving the Merrimac River, and as evidence of the agreement by the Commonwealth to a policy of co-operating with the federal government with respect thereto, the expenditure of this appropriation to be conditioned upon the passage by Congress of appropriations for the same purpose.

Pollock Rip Channel.

At a meeting of the Board held Oct. 22, 1913, the following resolution was adopted: —

Resolved, That the board of harbor and land commissioners of the commonwealth of Massachusetts, in consideration of the great importance to the maritime world of the improvement of Pollock Rip Channel through

the shoals lying near the entrance to Nantucket Sound, in Massachusetts, respectfully urges upon the senators and representatives from this commonwealth in congress the necessity for such further appropriations by the federal government as may be required to carry to completion such dredging operations in this channel as the needs of commerce call for; also for such appropriations as may from time to time be necessary for the purpose of maintaining such works of improvement as may be undertaken by the federal government.

A copy of the foregoing resolution was sent to each of the Senators and Representatives from Massachusetts in Congress.

Provincetown Harbor.

During the year the attention of the Board has been called to the needs of the harbor at Provincetown stated in the following communication: —

Provincetown, Mass.

What Provincetown needs for the protection of life and property in her harbor is $50,000 to build a stone breakwater in the north central part, 20 feet high and 4,000 feet long, and having 12 feet of water behind it at low tide. It has always been the desire of fishermen, and in fact of all mariners who have made this a harbor of refuge in northeast to southwest gales, that there should be some shelter from these out-winds, and that desire has developed into a pressing need on account of the great change which has taken place in the methods of catching fish and in the type of craft employed in the business.

Although the fleet of 200 vessels averaging 90 tons which sailed from this harbor twenty-five years ago has been reduced to about 19 sail, this does not mean that there are fewer fish caught or a smaller number of men engaged in the work. We have a large fleet of nearly 300 fishing boats and 40 or more of from 15 to 20 tons. These together with our weir boats make a total value of about $300,000.

Not only does this property furnish the only business of the town, but every encouragement should be held out to the fishermen, for if there is any class of men that have been a potent factor in reducing the cost of living in our manufacturing towns and cities, it is those engaged in the hazardous task of going out upon the stormy deep to gather up and turn her products into economic value.

But it is not only for Provincetown that we make this plea to the State through your honorable Board, for there are hundreds of fishing boats which come here annually from other ports to pursue their work, and it is for these, as well as for the hundreds, and in some seasons thousands, of pleasure yachts that we make this request. Our zeal is quickened to the highest degree when we look back to the awful gale of the

winter of 1898, when 17 vessels were driven ashore, 7 of them being badly damaged and 2 destroyed, while 6 men were drowned, a calamity which would not have happened had there been a breakwater where these vessels could have made smooth water. We sincerely hope that the State will realize the needs of our harbors and rivers and put into the hands of the Board of Harbor and Land Commissioners an adequate sum for the many improvements which are required.

Believing that your Board will not withhold this protection after being placed in a position to remedy it, we remain

Yours truly,

C. Austin Cook,
A. P. Hannum,
James E. Rich,
Selectmen of Provincetown.

In the opinion of the Board an appropriation by the State to ascertain, by means of an examination and survey, estimates of the cost of building a protective structure such as is indicated in this letter is both necessary and desirable.

No expenditures have been made under the directions of this Board for the improvement of this harbor between 1893 and 1913.

The activities of the federal government in relation to Provincetown harbor are shown by the following extracts from the report of the Chief of Engineers, U. S. A., for 1913: —

Harbor at Provincetown, Mass. — This is an important harbor of refuge in the bight at the extremity of Cape Cod, about 40 miles southeast from Boston Light at the entrance to Boston Harbor.

In its original condition the width and depth of its entrance and the depth of its anchorage area, about 4,000 acres at the 18-foot contour lying within an east and west line through Wood End, were ample for the largest vessels, but actual or threatened inroads by the sea across the low and narrow part of the cape east of the town, and at intervals along about 1½ miles of the narrow beach southwest of the town, were a serious menace to the harbor.

The original project, adopted by the act of May 20, 1826, was "for the preservation of the point of land forming Provincetown Harbor."

The project from 1826 continuously to this date has been, by building dikes and groins and by other sand-catching devices, to arrest the erosion and promote the accretion of the barrier of beach and sand dunes which protects and preserves the harbor.

No modification has been made in the existing project since its adoption.

References to Examination or Survey Reports and Maps or Plans (including Project Documents).

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Description and plan of works, Provincetown Harbor.	–	–	–	–	1876[1]	181
Description and plan of works, Provincetown Harbor.	–	–	–	–	1879[2]	273
Description and plan of works, Provincetown Harbor.	–	–	–	–	1886[1]	574
For protection most slender part of beach, 1896.	House.	8[2]	Fifty-fifth.	First.	1897[1]	878
Protection of harbor by dike, 1910.	House.	821[2]	Sixty-first.	Second.	–	–

[1] Contains maps. [2] No maps.

During the fiscal year 30,045 tons of stone were deposited in the dike across House Point Island flats at an expenditure of $44,999.85, all for new work. Outstanding liabilities, $12,624.30.

The amount expended to June 30, 1913, was $306,896.41, all applied to improvement.

The preservation of the harbor, whose importance as a harbor of refuge requires no elaboration, depends upon the maintenance of the barrier from Abel Hill to Long Point as a protection against westerly and southwesterly seas. Since the commencement of the improvement it has been sought to maintain this barrier by means of timber structures of temporary character, designed to catch and hold the sand moved by the sea and wind. Although in the vicinity of and below Wood End they have been partially successful in accumulating sand moved by the wind, for the greater part of the distance between Abel Hill and Wood End they have failed in the long run to accomplish their purpose, and now for a considerable part of this distance there exists between the ocean and the harbor only a light, sand-filled, wooden bulkhead, built on the beach whose crest is below the level of spring tides. The failure of these works may be attributed to absence of any great quantity of wind-driven sand, and to the inability of light timber structures to withstand the inroads of the sea.

A rubblestone dike is about 80 per cent completed across House Point Island flats from the vicinity of Stevens Point to a point northeasterly from Wood End Light, with an appropriation of $140,000 made by the river and harbor act of June 25, 1910, and the balance available from prior appropriations.

The extension of the beach protection at Long Point, contemplated in the river and harbor act of June 25, 1910, is not considered necessary at the present time.

The maximum draft that can be carried to the anchorage is ample for the largest vessels. The mean range of tide is 9.2 feet.

The commerce of this port is a small factor in this improvement compared with the preservation of this very excellent and important harbor of refuge.

Commercial Statistics.

This is an important harbor of refuge, being the only harbor from Boston (52 miles north) to Vineyard Haven (about the same distance south) that will admit large vessels. The number of vessels following the route through Vineyard and Nantucket Sounds and along the eastern shore of Cape Cod is estimated (Annual Report of the Chief of Engineers for 1904, p. 963) to be annually upward of 50,000, of which it is reported that about 4,000 visit the harbor annually for shelter. The vessels are of all sizes and descriptions, but it is to the smaller sailing vessels that it affords the greatest protection.

Appropriations.

May 19, 1826	$3,500 00	June 18, 1878	$1,000 00
Mar. 2, 1829	3,500 00	Mar. 3, 1879	1,000 00
Mar. 2, 1831	2,050 00	June 14, 1880	500 00
Mar. 3, 1832	4,600 00	Mar. 3, 1881	5,000 00
June 28, 1834	4,400 00	Aug. 2, 1882	5,000 00
Mar. 3, 1835	4,400 00	July 5, 1884	2,000 00
July 2, 1836	4,400 00	Aug. 5, 1886	3,000 00
July 7, 1838	4,500 00	Aug. 11, 1888	7,000 00
Aug. 30, 1852	5,000 00	Sept. 19, 1890	7,500 00
June 28, 1864[1]	30,000 00	July 13, 1892	1,500 00
June 23, 1866	43,068 44	Aug. 18, 1894	1,500 00
July 28, 1866	8,000 00	June 3, 1896	1,500 00
Apr. 10, 1869[1]	8,910 00	Mar. 3, 1899	10,000 00
Mar. 3, 1871	6,000 00	June 13, 1902	11,000 00
June 10, 1872	5,000 00	Mar. 3, 1905	5,000 00
Mar. 3, 1873	6,000 00	Mar. 2, 1907	5,000 00
June 23, 1874	6,000 00	June 25, 1910	140,000 00
Mar. 3, 1875	5,000 00		
Aug. 14, 1876	4,000 00	Total	$365,828 44

Note. — From 1828 to 1860, $3,665.47 was carried to surplus fund and not expended. Authority: "Appropriations and expenditures, 1789 to 1882," page 156.

The total expenditures by the United States to June 30, 1913, amount to $306,896.41.

July 1, 1912, balance unexpended	$100,266 41
June 30, 1913, amount expended during fiscal year, for works of improvement	44,999 85
July 1, 1913, balance unexpended	$55,266 56
July 1, 1913, outstanding liabilities	12,624 30
July 1, 1913, balance available	$42,642 26
July 1, 1913, amount covered by uncompleted contracts	$30,621 80

[1] Allotments from general appropriations; dates of allotment unknown.

CONSOLIDATED.

July 1, 1912, balance unexpended	[1] $110,266 41
Amount appropriated by river and harbor act approved Mar. 4, 1913	83,500 00
	$193,766 41
June 30, 1913, amount expended during fiscal year, for works of improvement	44,999 85
July 1, 1913, balance unexpended	$148,766 56
July 1, 1913, outstanding liabilities	12,624 30
July 1, 1913, balance available	$136,142 26
July 1, 1913, amount covered by uncompleted contracts	$30,621 80
Amount (estimated) required to be appropriated for completion of existing project	[1] $20,700 00
Amount that can be profitably expended in fiscal year ending June 30, 1915, for maintenance of improvement,	[1] $5,000 00

WAREHAM RIVER.

After a survey and examination by the Board of Harbor Commissioners a harbor line was established in 1872 on Wareham River. No work of improvement has been undertaken by the Commonwealth at this place.

The following letter explains improvement desired: —

WAREHAM, MASS.

The selectmen have taken up the matter of improvement of Wareham harbor with interested parties and with influential citizens and organizations. The sentiment gained is that the Wareham River has become too shallow to accommodate present traffic of coal barges and other vessels, and is entirely inadequate for navigation by vessels of increased draft, which it is anticipated would make use of this harbor if conditions were improved. The selectmen are assured that an appropriation will be made by the town for the deepening of this channel, and aid will be asked from your Board in improving conditions. We are informed by present users of this channel that a considerable sum of money could be profitably used and would bring a return of increased business to the town, but considering the large amount of State and town taxes for 1913, and no possibility of reduction of expenses for 1914, we believe that from $10,000 to $15,000 would make a permanent improvement of the worst conditions at present encountered, and would satisfy the present users of this channel.

Yours respectfully,

LEWIS H. BULLARD,
Clerk of Selectmen.

[1] Exclusive of the balance unexpended July 1, 1913.

In the opinion of the Board an appropriation by the State for Wareham River is necessary and desirable.

Wellfleet Harbor.

There does not appear to have been any actual work done by the federal government in Wellfleet harbor subsequent to June, 1894. The report of the Chief of Engineers of that date states that up to June 30, 1893, expenditures amounting to $11,350.37 had been made. The original project was for a channel from Deep Hole to the town wharves, 4,200 feet long, 100 feet wide and 6 feet deep at mean low water.

Appropriations by the federal government, to June 30, 1913, aggregate $16,000, and expenditures, $11,365.57.

In the opinion of the Board an appropriation by the State for the improvement of Wellfleet harbor is necessary and desirable.

Great Ponds.

The Colony Ordinance of 1641–47 provides that "no town shall appropriate to any particular person or persons any great pond containing more than ten acres of land," and that "for great ponds lying in common, though within the bounds of some town, it shall be free for any man to fish and fowl there, and may pass and repass on foot through any man's property for that end, so they trespass not upon any man's corn or meadow."

The Commonwealth owns the Great Ponds as public property held in trust for public purposes, and the courts have held that the Commonwealth has the right to control and regulate the public uses to which these ponds may be applied; that in such ponds a grant bounded by the pond extends only to low-water mark; and that the proprietors of land bordering upon the ponds have no rights in the soil or in the water, unless it be by grant from the Legislature.

Previous to 1888 encroachments to a considerable extent had been made without right upon the waters of Great Ponds by owners of the surrounding land and others, but in that year a movement was started and the subject of the regulation and control of these ponds brought to the attention of the Legislature, and a bill prepared by this Board submitted. This

action resulted in the passage of chapter 318 of the Acts of 1888, now embodied in chapter 96 of the Revised Laws, which conferred upon this Board jurisdiction over all Great Ponds containing in their natural state 10 or more acres of land, with authority in respect to the granting of licenses for the building of structures in, over or upon the same, below the natural high-water mark, or at or upon any outlet thereof.

By chapter 379 of the Acts of 1904 the Board, under the authority and subject to the approval of the Governor and Council, is authorized to sell and convey or lease any of the islands owned by the Commonwealth in the Great Ponds.

In 1872, as appears from a list printed in the report of the State Board of Health for that year, the total area of ponds in Massachusetts containing 10 acres or more, was 92,938 acres.

From 1888 to Nov. 30, 1913, inclusive, 149 licenses, relating to Great Ponds and the outlets thereof, have been granted by the Board, of which 105 were for building structures, 42 for drawing water for flowing cranberry bogs and 2 for other purposes.

Surveys of a few of the Great Ponds have been made by this Board and the Commission on the topographical survey and map of Massachusetts in connection with the town boundary survey, being in addition to those made by the State in co-operation with the United States Geological Survey in 1884.

The topographical survey of the whole State in 1884 was plotted, and the maps published on a scale which does not show sufficient detail to determine with accuracy the areas of ponds.

Information concerning islands in Great Ponds belonging to the Commonwealth, many of which are of considerable value, is most meager, and the necessity for ascertaining their location, extent and other details is apparent.

Applications from time to time have been received either to purchase or lease some of these islands, but in practically all cases there have, upon examination, appeared good reasons for declining the application, although, in a few instances, permits have been granted, revocable at any time by the Board, for the use and occupancy of islands for a limited period.

There is submitted herewith a list of ponds containing ten or more acres, revised from the list of 1872 aforesaid so far as the limited accurate data in the possession of the Board allow.

The importance to cranberry growers of a knowledge of the sources and extent of water supply which may, under license of this Board, be availed of for flowing their bogs is well known, and it is considered that the great value of this industry alone justifies favorable action by the State in appropriating funds for surveys and examinations to enlarge the data and information now available.

It is recommended that the Board be authorized to make surveys, examinations, maps and plans of Great Ponds of the Commonwealth and of the islands therein, and that the necessary appropriation therefor be made. This recommendation has been embodied in a draft of a bill submitted.

Lake Quannapowitt.

By chapter 101 of the Resolves of 1913 the Board was directed to make an investigation and estimate of cost of dredging Lake Quannapowitt in the town of Wakefield. In accordance with the requirements of this resolve a report (House Document No. 759) has been submitted to the Legislature.

The Board recommends: —

That if action be favorable to the improvement of Lake Quannapowitt by dredging, the work be done by drawing off the water in the lake to the proposed new grade of the bottom, grade 83, and that the material be excavated in the dry. This would cover an area of 23 acres at the north end of the lake, and with a slope of 5 on 1 at the approach to the shore will require the removal of 50,000 cubic yards of material. The estimated cost of this work is $30,000.

It is further recommended that the dredged material be deposited on the low swamp land adjoining the northerly end of the lake, or used for the boulevard which it is understood the Metropolitan Park Commission contemplate laying out along the shore of the lake.

Little Pond, Falmouth.

On July 23, 1913, the Board gave a hearing to parties interested in the matter of a waterway from Little, or Leman, Pond in the town of Falmouth.

On that date a petition was filed, under chapter 481 of the Acts of 1909 and chapter 642 of the Acts of 1912, for a permanent waterway from this pond to Vineyard Sound.

No further action has been taken in this matter.

Long Pond, Harwich.

On Sept. 16, 1912, and Feb. 26, 1913, the Board gave public hearings to parties interested in the regulation and control of the height of water in Long Pond in the towns of Brewster and Harwich. Subsequently a survey and map of the outlet of the pond were made, and a bench mark established.

Various conflicting interests were represented at these hearings. It is claimed that obstructions placed in the outlet cause the water to remain at a height detrimental to certain property bordering the pond. The town of Harwich asserts that at certain times of the year such maintenance of the height of water is necessary to provide for the passage of fish.

After an examination, the town of Harwich was directed to prepare a plan or plans for the building of a fishway, or other suitable structure or structures, at the present outlet connecting Long Pond and Hinckley Pond, for the purpose of regulating and controlling the height of water in Long Pond, and to submit such plans to the Board.

South Watuppa Pond.

The attention of the Board has been called during the year to obstructions at the passageway under the railroad bridge at the northerly end of South Watuppa Pond in Fall River. It is claimed that the conditions there are dangerous to boating. An examination has been made by the Chief Engineer and conferences held with the railroad officials. In the opinion of the Board it is necessary and desirable that a small appropriation be made to remedy these conditions.

Nontidal Rivers and Streams.

The powers and duties of this Board, some of which in respect to Boston harbor have been affected by the provisions of chapter 748 of the Acts of 1911, are set forth in considerable detail in the report of the Board for the year 1911, pages 5–7.

This Board was established in 1879, with power additional to that conferred upon the Board of Harbor Commissioners in 1866 relating to tide waters. In 1885 its jurisdiction was extended over the Connecticut River and its banks, with authority to deal with this nontidal river in the matter of building certain structures and doing other work substantially as in the case of tidal rivers and harbors.

In 1888 its jurisdiction was further extended to Great Ponds in the Commonwealth containing in their natural state more than 10 acres of land, the provisions of law, so far as they could apply to other than tide waters, being made applicable to the licensing and building of structures, and other work in said ponds.

In 1909 the Board was authorized and directed to expend certain sums of money in improving and protecting rivers, harbors, tide waters and foreshores, — a delegation of authority previously exercised by the General Court, — thus obviating the necessity in many cases for filing petitions and obtaining special acts of the Legislature for doing work of this character.

In the opinion of this Board it is now necessary and desirable that supervision, regulation and control as broad and comprehensive as that now given over tidal rivers and harbors be provided with respect to nontidal rivers and harbors, and the Board authorized to undertake such work for the improvement, maintenance and protection of nontidal rivers and streams as it may deem to be reasonable and proper. In view of the fact that the attention of the public at large is now greatly centered on the important question of conservation and control of natural resources, it is respectfully recommended that a more extended jurisdiction than that hitherto conferred upon it be given this Board. The above recommendations, with other details, are embodied in two bills which have been submitted.

Province Lands.

Reclamation work on the Province Lands has been continued during the year in accordance with the methods previously employed, which have been fully described in reports of the Board. The work of brushing was resumed in the spring and transplanting begun as soon as the ground was in suitable condition.

About 42 acres have been covered with brush during the year, and 18,700 seedling pines, 13,000 pines on the sod and 380 oaks on the sod have been transplanted.

The sum of $166.65 has been paid into the State treasury during the year, being the amount received from licenses issued to various parties to cultivate and pick cranberries in the bogs on these lands and to mow meadow land.

A survey and map of the road across these lands from the town of Provincetown to Ocean View, a distance of 10,236 feet, was made during the year.

By chapter 88 of the Resolves of 1913 the Massachusetts Highway Commission was authorized to repair and surface the road built by the Commonwealth on the Province Lands, and to expend for this purpose a sum not exceeding $5,000.

Under the provisions of this resolve, 10,200 feet of road 12 feet wide have been surfaced with sand and oil by the layer method at a total cost of $4,730.40. The road is practically completed and is now ready for use. The balance of the appropriation will be needed during the early part of 1914 for repairs and the completion of certain details of the work.

Appropriations: —
1893–1912, inclusive, aggregate, ... $68,000

Amount expended during the year, $2,524.80.
Total amount expended to Dec. 1, 1913, $60,640.63.

Town Boundary Survey.

The field work of the year has consisted mainly in measuring the basic angles in the primary system of triangulation controlling the southern and western parts of the State beyond the Connecticut River, so that the detail work previously measured could be computed and reduced. Town corners in Alford, West Stockbridge and parts of Egremont and Great Barrington, Berkshire County, were located and described, traverses measured and photographs taken.

By agreement with the State Engineer of New York the broken roadstone at State line, where the Boston & Albany Railroad crosses the same, was replaced by a new stone, a representative of the State of New York being present and

assisting. A road bound on a discontinued road crossing the State line was also removed to the south side of the State highway from South Egremont to Hillsdale.

The field season was from April 28 to Nov. 11, 1913, but one party was withdrawn from the latter part of July to the early part of September, to run a line of levels along the Connecticut River.

For field work to complete the location of all town and city boundary lines in the State there remain only the easterly and southerly lines of Egremont, the westerly line of Sheffield and six or eight scattering corners to be located and described, or less than twenty-five in all. Stadia or plane-table surveys of Lake Buel, and about 5 miles of the Westfield river along the southern boundary of Middlefield, will also be required.

During the year various boards of selectmen have been notified through the Attorney-General's office of bounds missing or defective on eleven different lines. At these corners, points have been located near at hand in readiness to assist in locating and setting new bounds as soon as the stones are delivered on the ground.

This Board has not suggested any changes by straightening or otherwise improving existing lines, but the survey of this year has disclosed an uncertainty as to the line between Montgomery and Russell on account of there being several old stone piles on Mt. Shatterack to mark a slight angle in the line where the selectmen are unable to identify the correct point. At the suggestion of the selectmen a new line, not differing materially from the old one, will be proposed under authority of chapter 25, section 7 of the Revised Laws, and submitted to the next Legislature for action.

During the year 60 copies of the atlas describing the boundaries of 15 cities and towns, called the Amherst group in previous reports, have been distributed as required by law.

The atlas known as the Adams group, containing 28 cities and towns, is being printed.

Up to Dec. 1, 1913, atlases describing the boundaries of 284 cities and towns out of a total of 354 cities and towns in the Commonwealth have been completed, and 285 distributed as provided by statute.

Computations for the atlas of the Agawam group, including 22 cities and towns, are well advanced, and the historical data and descriptive matter are to be prepared for the printer.

The last atlas, known as the Alford group, including the following 20 towns, will also be taken in hand: Alford, Becket, Egremont, Great Barrington, Hinsdale, Lee, Lenox, Middlefield, Monterey, Mt. Washington, New Marlborough, Otis, Peru, Richmond, Sandisfield, Sheffield, Stockbridge, Tyringham, Washington and West Stockbridge.

Sale and Distribution of Massachusetts Atlas Sheets and Town Boundary Atlases.

Under authority of chapter 57, Resolves of 1890, chapter 42, Resolves of 1891, and chapter 360, Acts of 1900, 4,269 atlas sheets of the map of the Commonwealth and 5 town boundary atlases have been sold during the year, for which $399.50 was received. Under the provisions of chapter 26, Resolves of 1909, there has been expended from this amount $153 for the purchase from the United States Geological Survey of sheets required to keep in stock at all times copies of all the atlas sheets, leaving a balance of $246.50, which has been forwarded to the Treasurer and Receiver-General, as required by the resolve.

Chapter 360, Acts of 1900, as amended by chapter 484 of the Acts of 1909, directed this Board to make certain disposition of the atlases of the boundary lines of the various cities and towns in the Commonwealth. Under this authority 62 atlases have been distributed during the year.

Appropriation for Survey and Improvement of Harbors.

By chapter 36 of the Acts of 1913 an appropriation of $3,000 was made for surveys of harbors and for improving and preserving the same, and for repairing damages occasioned by storms along the coast line or river banks of the Commonwealth.

Expenditures from this appropriation have been made to Dec. 1, 1913, in the locality and to the amount following, viz.: —

Menamsha Inlet, timber fence,	$249 80
Cuttyhunk, repairing jetties,	495 21
Onset Bay, survey,	11 10
	$756 11

Wrecks and Obstructions.

Complaints in relation to wrecks and obstructions have been received, but it has not been necessary for the Board to make any expenditure from the appropriation for their removal.

Whenever a wreck is so located that action by the United States government rather than by the State seems proper, it is brought to the attention of the engineer officer in charge of the district.

Appropriation: —	
Chapter 36 of the Acts of 1913,	$2,000

No expenditures have been made during the year.

Cape Cod Canal.

Under the provisions of chapter 448 of the Acts of 1899, incorporating the Boston, Cape Cod & New York Canal Company, the Board of Railroad Commissioners and the Board of Harbor and Land Commissioners were constituted a Joint Board for the purpose defined in said act.

The act of 1899 was amended by chapter 476 of the Acts of 1900. Additional legislation is contained in chapter 519 of the Acts of 1910. Statements covering previous proceedings before this Board and the Joint Board, and action taken on the several petitions presented, are contained in the reports of this Board for the years 1907, pages 98–104; 1909, pages 17–19; 1910, pages 34–38; 1911, pages 65–68; 1912, pages 74–77.

On Dec. 27, 1912, the Joint Board heard parties interested in a petition of the Boston, Cape Cod & New York Canal Company for a determination of what bridge or bridges, ferry or ferries, across the canal, or tunnel or tunnels under the same, should be built in the village of Bournedale, in the town of Bourne, at a point designated by the county commissioners of Barnstable County April 30, 1912.

On Jan. 15, 1913, an order was passed by the Joint Board requiring the crossing of the canal at Sagamore to be made

by a drawbridge at a point designated by the county commissioners of Barnstable County April 30, 1912, and approving plans of said bridge.

On April 24, 1913, an order was passed by the Joint Board allowing the Canal Company a further period of one year from June 3, 1914, for the completion of the canal, and on the same date an order approving a supplemental agreement between the Canal Company and the Cape Cod Construction Company, authorizing the Canal Company to extend the time within which the Construction Company shall complete the canal to June 3, 1915.

On Jan. 15, 1913, April 24, 1913, June 20, 1913, and Sept. 25, 1913, orders were passed certifying and approving the issue by the Canal Company of stock and bonds aggregating 10,280 shares of stock and $1,030,000 in bonds, making authorization to Dec. 1, 1913, of a total of 41,040 shares of stock of the par value of $100 each and $4,110,000 in bonds.

These orders in relation to stock and bonds were issued in accordance with the requirements of chapter 448 of the Acts of 1899, as amended by chapter 476 of the Acts of 1900, and upon requisitions of the Cape Cod Construction Company to the Boston, Cape Cod & New York Canal Company for the amounts of stock and bonds of said Canal Company under and in accordance with the contract between said Canal Company and said Construction Company, dated March 27, 1907, accompanied by estimates made by the chief engineer of the Canal Company as to the amount of work done and expenditures made, which had previously been examined and verified by the Joint Board and its engineer.

On Sept. 24, 1913, hearing was held on complaint made by certain owners of property located at the upper part of Buzzards Bay, alleging that shoals had been caused at and in the vicinity of their land, by the dumping of material removed by the contractors engaged in dredging operations on the canal, at the dumping ground in Buzzards Bay between Abiel's Ledge and Dry Ledge. This dumping ground was prescribed by this Board under permits granted June 13, 1910, and Jan. 3, 1912, respectively, and dumping is done under an inspector in the employ of the federal government. All parties in interest were

fully heard, and it was concluded that no further action on the part of the Board was necessary at present.

No conclusive action has been taken during the year on the petition relating to the crossing at Bournedale.

Progress on the canal during 1913 is shown by the following statement furnished by the Canal Company: —

During the year work of the construction of the canal progressed, and at the close of the year every foot of the canal was either completed or was in course of completion. From the easterly end of the canal to Barnstable Bay the canal was substantially completed for a distance of nearly 4 miles, to the village of Bournedale. At the westerly end the canal had been completed from the mouth of the Monument River to a distance of nearly 2½ miles, to well beyond the village of Bourne. The advance dredges were less than 2 miles apart. The intervening space had been partially excavated by steam shovels working to a depth of 20 feet below the level of ground water, the excavation having been kept dry by pumps.

The approach channel in Barnstable Bay was substantially completed, and in Buzzards Bay for a distance of 5 miles all the heavy work had been finished, the only remaining work being cleaning up.

The breakwater in Barnstable Bay had been finished as well as a sand-catcher on the south side of the canal and parallel with the breakwater.

During the year the work of riprapping the banks had been carried on, following up the advance work of the dredges. At the easterly end both banks of the canal had been thus protected from the mouth of the canal to nearly the village of Bournedale, and at the westerly end from the mouth of the canal to beyond the village of Bourne.

The three bridges across the canal were all completed and in operation; the changes in the highways had all been made, as well as the relocation and reconstruction of the railroad.

The only work remaining was the completion of the excavation and the setting out of the lights and other aids to navigation.

Up to Dec. 1, 1913, the main items of work completed were as follows: —

Excavation (cubic yards),	12,691,531
Breakwaters (net tons),	328,332
Riprap (net tons),	83,781
Railroad construction (miles),	5.44
Bridges and approaches (feet),	2,042
Highway construction (miles),	4.60

Licenses granted during the Year.

Nos.

3696. Petition of Charles R. Crane for license to build sea wall and fill solid in Little harbor, Woods Hole, Falmouth. Granted Jan. 15, 1913.

Nos.

3697. Petition of Sarah A. Purinton for license to build a wharf in Plymouth harbor, Plymouth. Granted Jan. 15, 1913.

3698. Petition of Connecticut River Transmission Company for license to erect over Connecticut River, between Sunderland and Deerfield, a transmission line consisting of power, telephone and ground wires. Granted Jan. 15, 1913.

3699. Petition of Legrand L. Aldrich for license to build a pile wharf in Vineyard Haven harbor, Oak Bluffs. Granted Jan. 15, 1913.

3700. Petition of the Magnolia Beach Associates for license to lay and maintain a 12-inch cast-iron pipe and to build and maintain a pile and timber structure in Kettle Cove, Manchester. Granted Feb. 12, 1913.

3701. Petition of Victor Carbone, Alexander Carbone, Charles Carbone, John Carbone and Frederick Carbone for license to build a sea wall and fill solid on Merrimac River, Haverhill. Granted Feb. 12, 1913.

3702. Petition of the Beverly Gas and Electric Company for license to build a bulkhead and fill solid on Bass River, Beverly. Granted Feb. 12, 1913.

3703. Petition of Augustus L. Thorndike for license to excavate a ditch, build a pump well and draw water from Cobb's Pond, Brewster. Granted Feb. 12, 1913.

3704. Petition of James E. Graves for license to build sea walls, fill solid, maintain two marine railways and a pile pier and to dredge in Little Harbor, Marblehead. Granted Feb. 12, 1913.

3705. Petition of the Blue Pigeon Club, Incorporated, for license to build a sea wall and to fill solid in Broad Sound, Nahant. Granted April 2, 1913.

3706. Petition of the Duxbury Yacht Club for license to build a pile pier in Duxbury Bay, Duxbury. Granted April 2, 1913.

3707. Petition of the Magnolia Wharf Corporation for approval of plans for building a wharf and landing stage in Easterly Kettle Cove, Magnolia, as authorized by chapter 576 of the Acts of 1908 and chapter 115 of the Acts of 1910. Granted April 2, 1913.

3708. Petition of Benjamin Fox for license to build a pile pier and float stage in Peter's Cove, Wareham. Granted April 2, 1913.

3709. Petition of Oscar L. Gurney for license to build structures and draw water from Indian Head Pond, Hanson. Granted April 2, 1913.

3710. Petition of Solonois Childs for license to build a flume, lay a pipe and draw water from Crystal Lake, Orleans. Granted April 2, 1913.

3711. Petition of the Old Colony Railroad Company for license to place riprap in front of abutments of its bridge over Bass River, Dennis and Yarmouth. Granted April 2, 1913.

3712. Petition of the Salem Electric Lighting Company for license to build a sea wall on South River, Salem. Granted April 9, 1913.

Nos.

3713. Petition of the New Bedford Power Boat Club for license to build a pile structure for the support of a building, and a pile pier and float in New Bedford harbor, New Bedford. Granted April 9, 1913.

3714. Petition of the Southern Massachusetts Telephone Company for license to lay telephone cables in West Bay and Cotuit harbor, Barnstable. Granted April 9, 1913.

3715. Petition of Joseph Gardella for license to build a wall and fill solid on Merrimac River, Haverhill. Granted April 9, 1913.

3716. Petition of Albino Cassola for license to build a wall and fill solid on Merrimac River, Haverhill. Granted April 9, 1913.

3717. Petition of Alphonse M. Joly for license to build a sea wall and fill solid in Palmers Cove, Salem. Granted April 30, 1913.

3718. Petition of Richard A. Everson for license to erect a pumping plant and structures connected therewith, and to draw water from Indian Head Pond, Hanson and Pembroke. Granted April 30, 1913.

3719. Petition of Agnes D. Warbasse for license to build a pile pier, a portion of a boat house and two floats in Woods Hole Passage and Woods Hole Great Harbor, Falmouth. Granted April 30, 1913.

3720. Petition of Verdo R. Westgate for license to build a pile pier and float on Taunton River, Taunton. Granted April 30, 1913.

3721. Petition of Sally B. Holmes for license to build two boat landings in Marion harbor, Marion. Granted April 30, 1913.

3722. Petition of Frances Moulton for license to build a pile pier in Buttermilk Bay, Wareham. Granted April 30, 1913.

3723. Petition of the city of Fall River for license to construct a drain, fill solid and protect the slopes of the filling in South Watuppa Pond, Fall River. Granted April 30, 1913.

3724. Petition of the Old Colony Railroad Company for license to place riprap under its railroad bridge in North River, Scituate and Marshfield. Granted April 30, 1913.

3725. Petition of William F. Tegethoff for license to build a boat landing on Connecticut River, West Springfield. Granted May 7, 1913.

3726. Petition of the New Bedford Gas and Edison Light Company for license to lay a cable, for transmitting electricity, in Apponagansett River, Dartmouth. Granted May 7, 1913.

3727. Petition of Harry Webster Brown for license to build structures and draw water from Long Pond, Brewster. Granted May 7, 1913.

3728. Petition of the Beverly Yacht Club for license to build two pile wharves in Buzzards Bay at Butlers Point, Marion. Granted May 7, 1913.

Nos.

3729. Petition of the city of Beverly, by its water board, for license to build pile and timber structures and conduits and to lay a 12-inch water main in, over and under Bass River, at Bridge Street, Beverly. Granted May 7, 1913.

3730. Petition of the town of Falmouth, by its Eel Pond Channel bridge committee, for license to build a steel bridge, with a draw therein, across the channel from Woods Hole Great harbor to Eel Pond, Woods Hole, Falmouth. Granted May 14, 1913.

3731. Petition of the town of Amherst, by its board of sewer commissioners, for license to build a sewer outlet in Connecticut River, Hadley. Granted May 14, 1913.

3732. Petition of the Scituate Yacht Club for license to build a pile pier and float in Scituate harbor, Scituate. Granted May 14, 1913.

3733. Petition of the city of Salem for license to lay a 4-inch cast-iron water main in Beverly harbor from West Beach to Misery Island, Beverly. Granted May 14, 1913.

3734. Petition of the estate of Asa Shiverick for license to build a sea wall and fill solid in Eel Pond, Woods Hole, Falmouth. Granted May 14, 1913.

3735. Petition of the Springfield Provision Company for license to build a pile and timber crib and bulkhead and to fill solid in Connecticut River, opposite Plainfield Street, Chicopee. Granted May 21, 1913.

3736. Petition of the Riverside Park Amusement Company for license to build a boat landing and two pile dolphins on Connecticut River, near the foot of Elm Street, Springfield. Granted May 21, 1913.

3737. Petition of the city of Melrose, by its board of park commissioners, for license to build a wall and fill solid in Ell Pond, Melrose. Granted May 21, 1913.

3738. Petition of the Plymouth Cordage Company for license to build a sea wall and fill solid in Plymouth harbor, Plymouth. Granted May 21, 1913.

3739. Petition of the firm of Menard and Le Comte for license to lay a 6-inch pipe in Taunton River, at the westerly end of Essex Street, Fall River. Granted May 28, 1913.

3740. Petition of Anna W. Barker for license to build a flume and pump well, excavate a ditch and draw water from Fawn Pond, Plymouth. Granted May 28, 1913.

3741. Petition of the Springfield Gas Light Company for license to build a bulkhead and fill solid on Connecticut River, West Springfield. Granted May 28, 1913.

3742. Petition of the county commissioners of the county of Barnstable for approval of plans for building a new bridge over Bass River, Dennis and Yarmouth, as authorized and directed by chapter 395 of the Acts of 1913. Granted May 28, 1913.

Nos.

3743. Petition of Francisco Gardella for license to build a sea wall and fill solid on Merrimac River, Haverhill. Granted May 28, 1913.

3744. Petition of the Amherst Power Company for license to stretch six wires for transmission purposes over Connecticut River, between Chicopee and West Springfield. Granted May 28, 1913.

3745. Petition of the Amherst Power Company for license to stretch six wires for transmission purposes over Connecticut River, between Springfield and West Springfield. Granted May 28, 1913.

3746. Petition of William M. Ford for license to build a pump house, flume and submerged dam, to excavate a ditch and draw water from Bloody Pond, Plymouth. Granted June 4, 1913.

3747. Petition of Joseph Cabral for license to build a pile wharf in Provincetown harbor, Provincetown. Granted June 18, 1913.

3748. Petition of the town of Dartmouth, by its board of selectmen, for license to build and maintain a drain, for surface water only, in Clarks Cove, at the easterly end of Rogers Street, Dartmouth. Granted June 18, 1913.

3749. Petition of Wilson A. Hemenway for license to build a pile pier, float and timber runway on Saugus River, Saugus. Granted June 18, 1913.

3750. Petition of the Holyoke Ward Two Independent Club for license to build a bulkhead on Connecticut River, Chicopee. Granted June 18, 1913.

3751. Petition of the city of Salem for license to fill solid in Collins Cove, near the junction of Collins and Barton streets, Salem. Granted June 18, 1913.

3752. Petition of the county commissioners of Essex County for license to extend the fender guard of the Blynman bridge, so called, across the canal forming a part of Annisquam River, Gloucester. Granted June 25, 1913.

3753. Petition of the Marthas Vineyard Telegraph Company, Incorporated, for license to relocate a portion of its cable as now laid in tide water between Marthas Vineyard and Nantucket. Granted June 25, 1913.

3754. Petition of Fred Bunyan for license to build a boat landing on Connecticut River, Chicopee. Granted June 25, 1913.

3755. Petition of the Turners Falls Company for approval of plans for building a new dam and the doing of other work on Connecticut River at Turners Falls, Gill and Montague, as authorized by chapter 122 of the Acts of 1854, chapter 148 of the Acts of 1880, and chapter 197 of the Acts of 1913. Granted July 30, 1913.

3756. Petition of the Bay State Freezer, Incorporated, for license to build a pile wharf in Barnstable harbor, Yarmouth. Granted July 2, 1913.

Nos.

3757. Petition of Daniel E. O'Brien and Leonora F. Gorman for license to build a bulkhead, fill solid and maintain filling already done in Collins Cove, Salem. Granted July 9, 1913.

3758. Petition of the Springfield Canoe Association for license to locate and maintain a float stage and runway on Connecticut River, Springfield. Granted July 9, 1913.

3759. Petition of the United Electric Light Company for license to maintain a portion of a building used as a power plant, cribs, pipes and filling and an earth or cinder pier on Connecticut River, Springfield, on and beyond the river line established by chapter 301 of the Acts of 1893. Granted July 16, 1913.

3760. Petition of William M. Wood for license to build a wood and steel pier and float stage in Massachusetts Bay at Allens Head, Beverly. Granted July 16, 1913.

3761. Petition of the firm of Schortmann & O'Connor for license to maintain a floating boat house and two platforms on Connecticut River, southerly of and near North End bridge, Springfield. Granted July 16, 1913.

3762. Petition of Walter J. Tidd for license to maintain a boat landing and marine railway on Connecticut River, West Springfield. Granted July 16, 1913.

3763. Petition of Frederick W. Otto for license to maintain a floating boat house and floats on Connecticut River, Springfield. Granted July 30, 1913.

3764. Petition of Frederick W. Otto for license to maintain a marine railway, two floats and piles in Connecticut River, West Springfield. Granted July 30, 1913.

3765. Petition of Stillman B. Call for license to maintain a boat landing and float stage on Connecticut River, West Springfield. Granted July 30, 1913.

3766. Petition of Harmedos R. Forgette for license to maintain a floating boat house and two floats on Connecticut River, Springfield. Granted July 30, 1913.

3767. Petition of the city of Chicopee for license to fill solid in Connecticut River, Chicopee. Granted July 30, 1913.

3768. Petition of Carl Barck for license to build a pile wharf and float on Merrimac River at Salisbury Beach, Salisbury. Granted July 30, 1913.

3769. Petition of Carl Barck for license to build a pile wharf and float stage on Merrimac River at Plum Island, Newburyport, Granted July 30, 1913.

3770. Petition of the city of Worcester, by its board of park commissioners, for license to build a float stage in Lake Quinsigamond at Lake Park, Worcester. Granted Aug. 6, 1913.

Nos.

3771. Petition of the J. M. Guffey Petroleum Company for license to build sea walls and fill solid in Beverly harbor, Beverly. Granted Aug. 6, 1913.

3772. Petition of Halvor Torgesen for license to build and maintain structures and draw water from Great Indian Pond, Plympton and Kingston. Granted Aug. 6, 1913.

3773. Petition of Dolly C. Ames and Horace T. Ames for license to build a sea wall and fill solid on Merrimac River, Amesbury. Granted Aug. 6, 1913.

3774. Petition of Alvin F. Waite, Clarence H. Bartlett and Leander Brightman for license to construct a roadway from Horse Neck Point to Gooseberry Neck in Buzzards Bay, Westport. Granted Aug. 6, 1913.

3775. Petition of the county commissioners of the county of Essex for approval of plans for reconstruction of a portion of Groveland bridge on Merrimac River between Haverhill and Groveland, as authorized by chapter 826 of the Acts of 1913. Granted Sept. 3, 1913.

3776. Petition of the county commissioners of the county of Essex for approval of plans for reconstruction of a portion of Rocks bridge, so called, over Merrimac River between Haverhill and West Newbury, as authorized by chapter 631 of the Acts of 1913. Granted Sept. 3, 1913.

3777. Petition of John Collins for license to extend his wharf, on piles, on Merrimac River, Newburyport. Granted Sept. 3, 1913.

3778. Petition of the New Bedford Gas and Edison Light Company for license to lay a cable, for the transmission of electricity, in Acushnet River near the draw span of the New Bedford and Fairhaven bridge, New Bedford. Granted Sept. 17, 1913.

3779. Petition of the city of New Bedford for license to build a storm water overflow for the Calumet Street sewer in Clarks Cove, New Bedford. Granted Sept. 17, 1913.

3780. Petition of John Girdler for license to build a sea wall and fill solid in Beverly harbor, Beverly. Granted Sept. 17, 1913.

3781. Petition of the town of West Springfield for license to extend a sewer outlet in Connecticut River, southerly of and near the Old Toll bridge, West Springfield. Granted Sept. 17, 1913.

3782. Petition of Alfred C. Webster for license to build a concrete retaining wall and fill solid on Merrimac River, Amesbury. Granted Sept. 17, 1913.

3783. Petition of Athanasse Charpentier for license to build a concrete wall and fill solid on Acushnet River, Acushnet. Granted Sept. 17, 1913.

Nos.

3784. Petition of the New Bedford & Onset Street Railway Company for license to build a plate girder bridge on piers of cast-iron cylinders filled with concrete, over Wareham River at the Narrows, so called, Wareham. Granted Sept. 24. 1913.

3785. Petition of Huybertie Pruyn Hamlin for license to extend a stone pier in Buzzards Bay, Mattapoisett. Granted Sept. 24, 1913.

3786. Petition of Ella A. Chesley and William A. Rugg for license to build a wall and fill solid on Little River, Haverhill. Granted Sept. 24, 1913.

3787. Petition of William C. Atwater and Company, Incorporated, for license to build a sea wall and fill solid in Taunton River, Fall River. Granted Sept. 24, 1913.

3788. Petition of the Massasoit Manufacturing Company for license to build a sea wall and fill solid in Taunton River, Fall River. Granted Sept. 24, 1913.

3789. Petition of William Enos for license to extend his wharf, on piles, in Provincetown harbor, Provincetown. Granted Oct. 22, 1913.

3790. Petition of Charles Whittemore for license to build a concrete wall and fill solid on East River at Onset, Wareham. Granted Oct. 22, 1913.

3791. Petition of the Andrew Kerr Company, Incorporated, for license to build bulkheads, pile wharf and float, to fill solid and to dredge in Plymouth harbor, Plymouth. Granted Oct. 27, 1913.

3792. Petition of the Marine Biological Laboratory for license to build a sea wall, fill solid and dredge in Eel Pond at Woods Hole, Falmouth. Granted Oct. 27, 1913.

3793. Petition of D. Blakely Hoar, Walter O. Luscombe and Gilman A. Drew, trustees of the Woods Hole Trust, for license to build a sea wall, pile wharf and floats, to fill solid and to dredge in Woods Hole Great harbor at Woods Hole, Falmouth. Granted Oct. 27, 1913.

3794. Petition of William A. Publicover for license to build a retaining wall and fill solid in Gloucester harbor at Rocky Neck, Gloucester. Granted Oct. 29, 1913.

3795. Petition of Lucy G. Morse for license to build and maintain a pile pier in Cotuit harbor at Cotuit, Barnstable. Granted Oct. 29, 1913.

3796. Petition of William P. Bodfish and William G. Manter for license to build a pile pier in Vineyard Haven harbor, Tisbury. Granted Oct. 29, 1913.

3797. Petition of Ray D. Wells for license to build a pile pier and two marine railways in Deacons Pond harbor, Falmouth. Granted Oct. 29, 1913.

Nos.

3798. Petition of Walter G. Miller for license to build a boat landing on Connecticut River, Springfield. Granted Oct. 29, 1913.

3799. Petition of William F. Ennis for license to build a wharf on Merrimac River, above Deer Island, Amesbury. Granted Oct. 29, 1913.

3800. Petition of William F. Ennis for license to build a wharf on Merrimac River, below Deer Island, Amesbury. Granted Oct. 29, 1913.

3801. Petition of William F. Moquin for license to build a boat landing on Connecticut River at Riverside Park, Holyoke. Granted Oct. 29, 1913.

3802. Petition of A. E. Thacher for license to build post and timber structures in Little Mill Pond, Chatham, in renewal of license No. 3649 granted by the Board March 20, 1912. Granted Nov. 5, 1913.

3803. Petition of the Massachusetts Highway Commission for license to construct a concrete bridge in and over East River at Onset, Wareham. Granted Nov. 5, 1913.

3804. Petition of Agnes D. Warbasse for license to build and maintain a pile pier and marine railway in Woods Hole Great harbor, at Woods Hole, Falmouth. Granted Nov. 26, 1913.

3805. Petition of Delia S. Baer for license to build a wall and fill solid in Manchester harbor, Manchester. Granted Nov. 26, 1913.

3806. Petition of the Metropolitan Park Commission for license to fill solid in Lynn harbor in the town of Nahant. Granted Nov. 26, 1913.

3807. Petition of John Woodbury, and John Woodbury and Ernst M. Parsons, trustees under the will of John P. Woodbury, for license to fill solid in Lynn harbor, Lynn. Granted Nov. 26, 1913.

3808. Petition of the W. G. King Company for license to fill solid in Lynn harbor, Lynn. Granted Nov. 26, 1913.

3809. Petition of Kate King for license to fill solid in Lynn harbor, Lynn. Granted Nov. 26, 1913.

3810. Petition of Lucy A. Heys for license to fill solid in Lynn harbor, Lynn. Granted Nov. 26, 1913.

3811. Petition of Thomas P. Gard for license to fill solid in Lynn harbor, Lynn. Granted Nov. 26, 1913.

3812. Petition of the Lynn Yacht Club for license to fill solid in Lynn harbor, Lynn. Granted Nov. 26, 1913.

Miscellaneous Permits granted during the Year.

Charles R. Crane, to dredge in dock adjoining his wharf in Great harbor at Woods Hole, Falmouth. Granted Jan. 15, 1913.

New Bedford, Marthas Vineyard & Nantucket Steamboat Company, to dredge in dock adjoining wharf used by said company at Woods Hole, Falmouth. Granted Jan. 15, 1913.

Ellen M. Boardman, to remove material from Salters Beach, Plymouth. Granted Jan. 15, 1913.

Buzzards Bay Land Company, to excavate in Buttermilk Bay in front of its property in the town of Wareham. Granted April 2, 1913.

Eastern Dredging Company, to dredge material from Shirley Gut, northerly of Deer Island and easterly of Point Shirley, in Boston harbor. Granted May 14, 1913.

Eastern Dredging Company, to dredge material from that part of Broad Sound in Boston harbor adjoining the 35-foot channel and easterly and southeasterly of Great Fawn Beacon. Granted May 14, 1913.

Theodore P. Adams, to place six loads of gravel on beach at his premises in Plymouth. Granted June 2, 1913.

Harry E. Hunt, to construct and maintain two fish weirs southeasterly of Browns Bank at the entrance of Plymouth harbor. Approval of license issued June 9, 1913, by the selectmen of Plymouth. Granted June 25, 1913.

Chester W. Gott, to construct and maintain a fish trap in the waters within the limits of the town of Rockport. Approval of license issued May 22, 1913, by the selectmen of Rockport. Granted June 25, 1913.

Springfield Navigation Company, to excavate a channel near the present landing at the property of the Riverside Amusement Company on Connecticut River, Agawam. Granted July 14, 1913.

John W. Hurley, to construct and maintain a fish weir southeasterly of Browns Bank at the entrance to Plymouth harbor. Approval of license issued by selectmen of Plymouth July 21, 1913. Granted Aug. 6, 1913.

Boston & Albany Railroad Company, to construct and maintain temporarily in Connecticut River temporary supports to carry its bridge at Springfield. Granted Aug. 6, 1913.

Town of Manchester, to dredge in Manchester harbor southerly of the Boston & Maine Railroad and westerly of Beach Street. Granted Aug. 20, 1913.

Bay State Dredging Company, Ltd., to dredge in Pines River. Granted Aug. 27, 1913.

Levi L. H. Taylor, to remove stones from bed of Merrimac River. Granted Sept. 4, 1913.

H. L. Andrews and E. U. Iwwerks, to use and occupy a part of Berry Island in Lake Winthrop, Holliston. Granted Sept. 10, 1913.

Oscar C. Davis, to remove material from beach at Sias Point, East Wareham. Granted Sept. 17, 1913.

Henry W. Breed, to dredge a channel in Lynn harbor. Granted Oct. 15, 1913.

Charles Whittemore, to dredge in East River at Onset, Wareham. Granted Nov. 5, 1913.

Bay State Dredging Company, Ltd., to dredge in Pines River. Granted Nov. 12, 1913.

Town of Manchester, to dredge in Manchester harbor northerly of wharf on park property belonging to said town. Granted Nov. 12, 1913.

M. J. Carroll, to cut brush on bank of Connecticut River at Agawam. Granted Nov. 12, 1913.

Weymouth Back River Bridge.

By chapter 739 of the Acts of 1911 the construction of a new bridge across Weymouth Back River, connecting the town of Weymouth with the town of Hingham, was authorized, and the members of the Board of Harbor and Land Commissioners, the chairman of the county commissioners of Norfolk County, and the chairman of the county commissioners of Plymouth County, were appointed a Board of Bridge Commissioners and directed to do the work. This act was amended by chapter 227 of the Acts of 1912.

The Commonwealth, under the act of 1911 aforesaid, is required to pay 45 per cent. of the cost and expenses incurred, but of any sums that may be received from the United States in reimbursement of expenditures there shall be distributed 45 per cent. to the Commonwealth of Massachusetts, 20 per cent. to the county of Norfolk, 20 per cent. to the county of Plymouth and 15 per cent. to the street railway company that may be granted a location on the new bridge.

This bridge was completed on April 16, 1913, and the Bridge Commissioners, on July 1, 1913, filed with the clerk of the Superior Court for the county of Norfolk their report.

Inspection of Massachusetts Rivers and Harbors by Congressional Committee on Rivers and Harbors.

On the invitation of the Harbor and Land Commissioners, members of the congressional committee on rivers and harbors made an inspection Oct. 4 to 9, 1913, in company with members of this Board, of certain rivers and harbors of Massa-

chusetts, including Connecticut River at Springfield and Holyoke; Boston harbor, by invitation of the Directors of the Port of Boston; Merrimac River at Newburyport, Lowell, Lawrence and Haverhill; Beverly harbor; Salem harbor; Lynn harbor; Cape Cod Canal; New Bedford harbor; Fall River harbor; Taunton River at Fall River and Taunton.

Conclusion.

If Massachusetts is to be placed in a position to adequately utilize the opportunity for the development of water transportation that is bound to follow the completion of the Panama Canal, the Cape Cod Canal and the New York Barge Canal, large expenditures must be made in her rivers and harbors to meet the requirements of modern water carriers.

It is not sufficient to develop only the Port of Boston for the obvious reason that any shipment to a water point via Boston involves an entirely unnecessary, additional charge for rehandling and reshipping from Boston to the final destination, which must become a tax upon the industries of those communities. There is no advantage to the Commonwealth in such a diversion of traffic from its natural course.

The future of water transportation is very much concerned in rail rates from water points to interior points, and also in joint rail and water rates. At present, rail rates from water points to the interior are made to prevent competition in those commodities that would naturally take the cheaper water and rail route rather than the all rail route. This frequently leads to excessively high rates for short rail hauls, and a consequent loss to the community whose proximity to a water terminal would naturally entitle it to the benefit of the cheaper water rates.

The joint rail and water rate has resulted in preventing any competition between water carriers for this joint business because the rate has only been given to those lines that are either owned or controlled by the railroads.

It is to be hoped that the proposed separation of the New York, New Haven & Hartford Railroad from its steamship lines will terminate their present control over water traffic on Long Island Sound, and open this great water highway to active competition in water carriers. The separation will also end the

present railroad control of joint rail and water rates, and will lead to the making of rail rates to and from water terminals that will be open to any water carrier, irrespective of ownership. Under existing conditions it is practically impossible to secure competition in water transportation because of the difficulty in establishing water lines in the face of the railroad control of the joint rail and water rates. The completeness of this control is fully and clearly set forth in the report to the President of the United States of the Commissioner of Corporations in 1912, on the "Control of Water Carriers by Railroads and by Shipping Consolidations."

The gravity of the situation, in its relation to the Atlantic and Gulf coasts, is clearly stated by the commissioner in the following words: —

> On this great water highway, where the volume and variety of traffic are exceptionally favorable to active competition, practically every important carrier engaged in regular through-line business, whether passenger or package freight, is either under the control of railroads or has been acquired by one or the other of two shipping consolidations. The extensive water traffic between New York City and New England ports is almost completely controlled by a single railroad — the New York, New Haven & Hartford.

Water transportation is of vital importance at this time to the prosperity of the Commonwealth of Massachusetts, from the fact that nearly all of its industrial centers are either located upon tide water or upon large rivers, with almost unlimited possibilities in both cases for the development of water transportation, although at present they are either entirely without such facilities or what they have are extremely inadequate.

A comparison of the capital invested in manufacturing in the cities located on waterways with the capital invested in manufacturing in the cities not on waterways shows the great possibilities in securing water traffic to the industries already established on the waterways of this State.

Total capital invested in manufacturing in the 33 cities in Massachusetts at the close of the year 1912,	$949,763,665
Invested in cities on tide water,	485,870,684
Invested in cities on rivers directly connected with tide water,	283,794,673
Invested in cities not on waterways,	180,098,308

In other words, more than four-fifths of the above manufacturing capital is invested in cities upon waterways.

The value of the stock and materials used in 1912 by the establishments representing the above capital was $680,134,782, of which over four-fifths was used in the cities on waterways.

In 1912 the 33 cities of the Commonwealth paid a State tax of $4,553,125, of which the 23 cities on waterways paid $3,900,812, or slightly more than one-half of the entire State tax.

The foregoing report is respectfully submitted.

WILLIAM S. McNARY,
GEORGE E. SMITH,
CHARLES C. PAINE,
Commissioners.

DEC. 1, 1913.

APPENDIX.

APPENDIX A.

[See page 4 of this report, *ante*.]

CONTRACTS MADE AND PENDING DURING THE YEAR 1913.

Contract No.	Work.	Contractor.	Date.	To be completed.	Condition of Work.	Prices.	Amount.
138	Ipswich River, jetty at entrance, .	Thomas Fitzgibbon, . .	Apr. 14, 1911	Sept. 1, 1911	Contract closed.	$2.43 per ton, ...	$4,053 75
151	Herring River and Witchmere harbor, dredging channels.	John R. Burke, . . .	Sept. 18, 1912	June 1, 1913	Completed,	$13,700, ...	13,700 00
152	Lynn harbor dredging anchorage basin.	J. P. O'Riorden, . . .	May 28, 1913	Dec. 1, 1913	In progress,	Dredging, 20⅞ cents per cubic yard, measured in scows. Excavating bowlders, $11 per cubic yard.	19,831 25
153	Hull, concrete sea wall and spur jetties between Gun Rock and Green Hill.	William Sears and James H. Connolly.	Oct. 2, 1912	July 1, 1913	Completed,	$5.60 per cubic yard of concrete in place.	23,588 19
155	Hyannisport, building breakwater,	William H. Ellis, . . .	Sept. 18, 1912	June 1, 1913	Completed,	Stone, $2.40 per ton. Clamps, $3.25 each.	22,956 60
156	Nantucket harbor, dredging channel and anchorage basin.	Charles M. Cole, . . .	Nov. 13, 1912	Oct. 1, 1913	Completed,	24.3 cents per cubic yard, measured in scows.	25,825 07
157	Harbor Cove, Gloucester, removal of ledges and bowlders.	Eastern Dredging Company,	Dec. 26, 1912	July 1, 1913	Completed,	$18.90 per cubic yard, . .	4,611 60
158	Woods Hole Great harbor to Eel Pond, Falmouth, dredging channel.	J. S. Packard Dredging Company.	Aug. 6, 1913	Dec. 31, 1913	In progress,	$6,500, ...	6,500 00
159	South River, Salem, dredging, .	Eastern Dredging Company,	May 28, 1913	Aug. 1, 1913	Completed,	Dredging, 35 cents per cubic yard, measured in scows. Excavating bowlders, $8 per cubic yard.	4,742 00
160	Saugus River, dredging channel, .	Bay State Dredging Company, Limited.	May 28, 1913	Oct. 1, 1913	In progress,	Dredging, 33.9 cents per cubic yard, measured in scows. Excavating bowlders, $5 per cubic yard.	17,390 70
161	Witchmere harbor, Harwich, dredging.	John R. Burke, . . .	Apr. 30, 1913	July 1, 1913	Completed,	30 cents per cubic yard, measured in scows.	1,333 20

CONTRACTS MADE AND PENDING, ETC. — *Concluded.*

Contract No.	Work.	Contractor.	Date.	To be completed.	Condition of Work.	Prices.	Amount.
162	Manchester harbor, dredging in channel.	Eastern Dredging Company,	May 28, 1913	Dec. 1, 1913	In progress,	Dredging, 23.9 cents per cubic yard, measured in scows. Excavating bowlders, $8 per cubic yard.	$15,774 00
163	Onset Bay, Wareham, dredging channel.	John R. Burke, . . .	June 25, 1913	Nov. 1, 1913	In progress,	Dredging, 28⅜ cents per cubic yard, measured in scows. Excavating bowlders, $10 per cubic yard.	9,221 88
164	Scituate harbor, dredging channel,	J. P. O'Riorden, . . .	July 16, 1913	Dec. 1, 1913	Completed,	Dredging, 27½ cents per cubic yard, measured in scows. Excavating bowlders, $6 per cubic yard.	15,328 25
165	Annisquam River, Gloucester, dredging channel.	Eastern Dredging Company,	July 30, 1913	Dec. 31, 1913	In progress,	Dredging, 24.8 cents per cubic yard, measured in scows. Excavating bowlders, $10 per cubic yard.	19,344 00
166	Sandwich harbor, dredging channel,	J. S. Packard Dredging Company.	Oct. 29, 1913	June 1, 1914	Not commenced.	35 cents per cubic yard, measured in scows.	15,750 00
168	Agawam, Connecticut River, riprap.	Daniel O'Connell's Sons, .	Sept. 17, 1913	Dec. 1, 1913	In progress,	Stone in place, $2.30 per ton of 2,000 pounds.	2,300 00
169	Hull, concrete sea wall and spur jetties at Green Hill.	William Sears and James H. Connolly.	Sept. 17, 1913	Dec. 31, 1913	In progress,	$6.50 per cubic yard of concrete in place.	8,840 00
170	Hatfield, Connecticut River, earth dike.	Daniel P. Sheehan, . .	Oct. 1, 1913	Dec. 30, 1913	Completed,	Building dike, 46¾ cents per cubic yard of material in place. Akron pipe drains, $135 each.	5,304 35
171	Cohasset harbor, dredging in channel.	J. P. O'Riorden, . . .	Sept. 17, 1913	Dec. 1, 1913	Completed.	Dredging, 27½ cents per cubic yard, measured in scows. Excavating bowlders, $6 per cubic yard.	1,019 72
172	Vineyard Haven harbor, dredging channel.	Charles M. Cole, . . .	Oct. 27, 1913	Dec. 31, 1913	In progress,	Dredging, 29¼ cents per cubic yard, measured in scows. Excavating bowlders, $10 per cubic yard.	4,387 50
173	Chicopee, Connecticut River, concrete retaining wall and stone riprap.	Daniel O'Connell's Sons, .	Nov. 12, 1913	Dec. 31, 1913	In progress,	Concrete in place, $7.70 per cubic yard, measured in place. Stone riprap, $2.06 per ton of 2,000 pounds.	5,829 00
174	Sandwich harbor, stone and concrete jetty and stone riprap.	William Sears and James H. Connolly.	Oct. 29, 1913	June 1, 1914	Not commenced.	Stone in place, $3 per ton of 2,000 pounds. Concrete in place, $10 per cubic yard.	13,500 00

APPENDIX B.

CONTRIBUTIONS AND EXPENDITURES FOR RIVER AND HARBOR WORK UNDER DIRECTION OF THE HARBOR AND LAND COMMISSIONERS, MADE DURING THE YEAR ENDING NOV. 30, 1913, UNDER CHAPTER 481, ACTS OF 1909, AND CHAPTER 642, ACTS OF 1912.

LOCATION.	Character of Work.	Contribution by Municipality or Others.	Expenditure.
Agawam, Connecticut River,	Survey,	–	$101 00
Annisquam River, Gloucester,	Survey,	–	368 27
Apponagansett harbor,	Prints,	–	1 54
Bass River, Yarmouth,	Survey,	–	328 20
Bussards Bay, Falmouth,	Survey,	–	150 36
Chicopee, Connecticut River,	Survey,	–	82 85
Cohasset harbor,	Dredging,	–	658 17
Connecticut River,	Survey,	–	3,734 13
Cuttyhunk harbor,	Repairing jetties,	–	94 29
Duxbury harbor,	Survey,	–	116 24
Gloucester harbor,	Survey,	–	164 97
Harbor Cove, Gloucester,	Survey,	–	16 07
Hatfield,	Dike,	$1,000 00	1,060 23
Herring River, Harwich,	Dredging,	–	9,430 10
Housatonic River,	Survey,	–	11 29
Hull,	Sea walls,	9,000 00	3,171 61
Hyannisport,	Breakwater,	2,500 00	24,276 45
Little River, Gloucester,	Survey,	–	862 93
Lynn harbor,	Survey,	–	6 56
Manchester harbor,	Dredging,	8,000 00	17,226 62
Merrimac River,	Prints,	–	2 22
Mill River, Gloucester,	Dredging,	–	3,688 60
Miscellaneous expenses,	–	–	511 39
Nantucket harbor,	Dredging,	1,000 00	16,545 40
Onset Bay,	Dredging,	1,000 00	6,837 49
Pamet River,	Survey,	–	18 00
Rock harbor, Orleans,	Survey,	–	40 60
Salters Point, Dartmouth,	Survey,	–	114 30
Sandwich harbor,	Survey,	–	191 27
Saugus River,	Dredging,	2,000 00	12,618 96
Scituate harbor,	Dredging,	3,000 00	15,162 38

CONTRIBUTIONS, ETC. — *Concluded.*

LOCATION.	Character of Work.	Contribution by Municipality or Others.	Expenditure.
South River, Salem,	Dredging,	–	$5,283 12
Taunton River,	Survey,	–	117 52
Vineyard Haven harbor,	Survey,	–	131 71
Witchmere harbor,	Dredging,	–	4,651 43
Woods Hole Great harbor,	Dredging,	$1,500 00	3,032 87
		$29,000 00	$130,809 14[1]

[1] In addition, amounts due under completed contracts and estimated amounts to be paid under pending contracts approximate $99,403.16.

APPENDIX C.

APPROPRIATIONS, CONTRIBUTIONS AND EXPENDITURES FOR RIVER AND HARBOR WORK UNDER THE DIRECTION OF THE BOARD OF HARBOR AND LAND COMMISSIONERS, FROM 1893 TO 1913, INCLUSIVE.

[Excepting Boston main harbor.]

LOCALITY.	Character of Work.	Total Appropriation.	Contribution by Municipality or Others.	Total Expenditure.
Allens harbor, Harwich,	Survey,	$219 50	-	$219 50
Annisquam River,	Dredging,	65,549 57	-	65,179 69
Apponagansett harbor,	Stone breakwater,	40,501 54	-	40,222 87
Barnstable harbor,	Survey,	217 51	-	217 51
Bass River, Beverly,	Dredging,	25,539 81	$55,535 75	81,075 56
Bass River, Yarmouth,	Jetties, dredging and survey.	54,373 80	-	52,888 80
Bucks Creek, Chatham,	Jetty and survey,	10,805 18	1,000 00	11,633 86
Buzzards Bay, Falmouth,	Survey,	150 36	-	150 36
Cataumet harbor,	Survey,	500 00	-	356 33
Centerville River,	Dredging,	6,103 22	1,500 00	7,603 22
Cohasset harbor,	Breakwater and dredging.	30,658 22	20,691 88	51,350 10
Connecticut River,	Investigation of navigation and surveys.	9,234 13	-	6,522 14
Agawam,	Protective work,	13,112 86	-	11,531 19
Chicopee,	Survey,	82 85	-	82 85
Hadley,	Protective work,	81,504 25	500 00	78,801 54
Hatfield,	Dikes,	6,760 98	1,000 00	7,760 98
Holyoke,	Dredging,	15,000 00	-	-
Northampton,	Protective work,	1,525 80	-	1,524 20
West Springfield,	Protective work,	5,135 00	-	5,051 49
Cotuit harbor,	Dredging,	31,471 85	2,000 00	30,443 74
Cuttyhunk harbor,	Jetties and dredging,	39,774 74	8,000 00	47,700 67[1]
Deacons Pond, Falmouth,	Jetties and dredging,	33,557 61	12,000 00	45,557 61
Dorchester, easterly shore,	Dredging,	70,363 66	-	70,171 31
Duxbury harbor,	Survey,	116 24	-	116 24
East Bay, Osterville,	Jetties and dredging,	23,272 10	-	22,937 54
Essex River,	Dredging	5,000 00	-	5,000 00[2]
Gloucester harbor,	Survey,	164 97	-	164 97
Green harbor,	Jetties and dredging,	90,670 95	-	76,333 26
Harbor Cove, Gloucester,	Survey and dredging,	20,433 06	-	15,670 07

[1] Including $500 forfeited by contractor.

[2] Expended by United States government.

APPROPRIATIONS, ETC. — *Continued.*

LOCALITY.	Character of Work.	Total Appropriation.	Contribution by Municipality or Others.	Total Expenditure.
Harbor View,	Dredging,	$10,146 00	–	$146 00
Herring River, Harwich,	Jetties and dredging,	30,651 40	$2,000 00	32,432 10
Herring River, Wellfleet,	Dike and ditches,	11,832 74	10,000 00	21,800 73
Hingham harbor,	Dredging,	13,180 69	3,000 00	16,180 69
Houghs Neck, Quincy,	Dredging,	4,499 83	500 00	4,999 83
Housatonic River, Sheffield,	Survey,	2,011 29	–	2,011 29
Hull,	Sea wall,	25,235 32	9,000 00	28,406 93
Humarock Beach, Scituate,	Survey,	250 00	–	236 07
Hyannisport,	Survey and breakwater.	21,821 25	2,500 00	24,321 25
Improvement of rivers and harbors.	General expenses,	918 95	–	918 95
Ipswich River,	Dredging and jetty,	13,835 76	1,000 00	14,829 20
Island End River,	Survey,	264 10	–	264 10
Jeffries Point,	Dredging,	10,000 00	–	–
Lake Anthony, Oak Bluffs,	Jetties and dredging,	48,153 63	2,000 00	46,944 59
Lake Quannapowitt,	Investigation,	1,000 00	–	–
Lewis Bay, Hyannis,	Dredging,	17,260 65	–	17,012 22
Little River, Gloucester,	Survey,	862 93	–	862 93
Lobster Cove, Gloucester,	Dredging,	17,603 98	1,500 00	19,103 98
Lynn harbor,	Dredging and survey,	33,194 98	200 00	14,109 21
Manchester harbor,	Jetties and dredging,	34,456 46	27,500 00	61,934 30
Menamsha Inlet,	Jetties and dredging,	57,034 13	700 00	57,630 48
Merrimac River,	Investigation,	102 22	–	2 22
Mill River,	Survey and dredging,	16,739 61	–	16,739 61
Nantucket harbor,	Dredging,	42,058 63	1,000 00	42,779 78
Neponset River,	Dredging,	34,270 44	–	34,269 70
North River, Marshfield,	Survey and removing rocks.	3,632 08	1,800 00	5,432 08
Oak Bluffs,	Removing rocks,	500 00	–	462 50
Onset Bay,	Survey and dredging,	5,913 59	1,000 00	6,913 59
Orient Heights,	Dredging,	8,500 00	–	8,144 52
Pamet River,	Survey,	127 27	–	127 27
Paskamansett River,	Dredging,	2,187 35	–	2,187 35
Penikese Island,	Pile wharf and survey.	5,300 00	–	5,192 95
Plum Island River,	Survey,	983 31	–	983 31
Plymouth harbor,	Dredging,	155,951 83	71,294 55	227,244 11[1]
Province lands,	Reclamation,	68,000 00	–	60,640 63
Quansett harbor, Orleans,	Survey,	195 88	–	194 50
Quick's Hole,	Survey,	500 00	–	–

[1] $83,500 to be expended by United States government.

APPROPRIATIONS, ETC. — *Concluded.*

LOCALITY.	Character of Work.	Total Appropriation.	Contribution by Municipality or Others.	Total Expenditure.
Revere,	Stone breakwater,	$60,407 09	-	$60,397 93
Rock harbor, Orleans,	Dredging,	5,441 93	-	5,426 39
Rockport harbor,	Removing rocks,	8,000 00	-	7,319 70
Salters Point, Dartmouth,	Survey,	114 30	-	114 30
Sandwich harbor,	Survey,	417 71	-	417 71
Saugus River,	Survey and dredging,	11,981 92	$2,000 00	13,620 45
Scituate,	Sea walls and riprap,	40,726 08	-	39,621 21
Scituate harbor,	Dredging,	19,137 43	5,000 00	24,137 43
Scorton harbor, Sandwich,	Jetty and dredging,	19,426 39	500 00	17,774 34
Sesuit harbor, Dennis,	Jetty,	19,484 05	1,000 00	20,466 30
Shirley Gut,	Dredging,	1,906 20	-	1,906 20
Sippican harbor, Marion,	Survey,	7 17	-	7 17
Sippowissett,	Survey,	3 25	-	3 25
South Boston, southerly shore,	Dredging,	126,972 48	-	126,972 44
South River, Salem,	Dredging,	10,441 78	3,000 00	13,380 79
Stage harbor, Chatham,	Dikes,	9,231 93	-	9,231 93
Stony Beach, Hull,	Sea wall,	11,607 90	-	11,335 07
Taunton River,	Survey and investigation.	5,528 14	-	1,653 06
Taunton River-Boston harbor canal.	Survey,	10,000 00	-	9,932 75
Vineyard Haven harbor,	Stone breakwater,	30,886 30	-	30,363 57
Waquoit Bay,	Survey,	1,000 00	-	701 61
Watch Hill, Chatham,	Survey and riprap,	15,020 47	-	14,968 75
West Bay, Osterville,	Jetties and dredging,	45,460 82	-	45,423 45
West Falmouth harbor,	Dredging,	25,655 31	-	24,386 18
Weymouth Fore River,	Dredging,	38,991 19	-	24,066 70[1]
Wild harbor, Falmouth,	Breakwater,	5,157 14	-	100 27
Winthrop harbor channel,	Dredging,	18,959 21	700 00	17,704 63
Winthrop harbor, Cottage Park,	Dredging,	6,603,00	-	6,581 66
Witchmere harbor, Harwich,	Jetties and dredging,	27,415 06	1,000 00	28,272 36[2]
Wollaston Beach, Quincy,	Dredging,	15,066 00	-	14,644 61
Woods Hole Great harbor, Falmouth.	Dredging,	1,532 87	1,500 00	3,032 87
Wrecks,	Removal from tide water.	64,416 66	-	6,948 78
		$2,037,975 84	$251,922 18	$2,092,640 53

[1] $1.15 paid from small items appropriation.

[2] $3.64 paid from small items appropriation.

APPENDIX D.

[See page 154 of this report, *ante*.]

PONDS OF TEN OR MORE ACRES.

Barnstable County.

[Total acreage of ponds listed, about 9,584.]

[Ponds where licenses have been granted by the Harbor and Land Commissioners are indicated thus, *. Ponds used as a source of water supply are indicated thus, †.]

NAME.	Town.	Approximate Area in Acres.	Outlet.
Chequaquet Lake or Great Nine Mile Pond.	Barnstable,	640	Herring River.
Half Way Pond,	Barnstable,	12	None.
Hamlins Pond or Mystic Lake,	Barnstable,	147	None.
Pond northwest of same,	Barnstable,	11	None.
Hathaways Pond (north),	Barnstable,	21	None.
Hathaways Pond (south),	Barnstable,	15	None.
Israels Pond,	Barnstable,	21	None.
Lewis Pond,	Barnstable,	10	None.
Long Pond in west part,	Barnstable,	63	None.
Long Pond near Centreville,	Barnstable,	69	Herring River.
Lovells Pond,	Barnstable,	48	Brook to Osterville harbor.
Lumberts Pond,	Barnstable,	15	None.
Micahs Pond,	Barnstable,	14	None.
Mill Pond,	Barnstable,	18	Brook.
Mill Pond west of Centreville,	Barnstable,	16	None.
Pond north of same,	Barnstable,	12	None.
Muddy Pond,	Barnstable,	25	Brook.
Round Pond,	Barnstable,	13	None.
Shallow Pond,	Barnstable,	90	None.
Shubael Pond,	Barnstable,	50	None.
Pond north of same,	Barnstable,	118	Brook.
Pond southwest of same,	Barnstable,	126	None.
Small Pond,	Barnstable,	22	None.
Spruce Pond,	Barnstable,	12	Bridge Creek.
Stewards Pond,	Barnstable,	36	None.
Two ponds west of Hyannis,	Barnstable,	22	None.

Barnstable County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
Bourne Pond,	Bourne,	13	None.
Deep Bottom Pond,	Bourne,	34	None.
Ellis Pond,	Bourne,	25	Brook.
Flax Pond,	Bourne,	64	None.
Lily Pond,	Bourne,	21	None.
Long Pond,	Bourne,	28	None.
Lower Pond, Pocasset,	Bourne,	10	Barlow River.
Mill Pond,	Bourne,	57	Back River.
Pond in South Pocasset,	Bourne,	22	Brook to Red River harbor.
Queen Sewell Pond,	Bourne,	14	None.
Succonnessett Ponds (2),	Bourne,	24	None.
Upper Pond, Pocasset,	Bourne,	20	Barlow River.
Bangs or Seymours Pond,	Brewster and Harwich,	181	Brook to Grassy Pond.
Beneyos Pond,	Brewster,	13	None.
Chime Pond,	Brewster and Harwich,	25	Long Pond.
Cliff Pond,	Brewster,	141	None.
Three ponds south of same,	Brewster,	41	None.
* Cobbs Pond,	Brewster,	28	None
Elbow Pond,	Brewster,	51	None.
Flax Pond,	Brewster,	40	None.
Francis Cahoon Pond,	Brewster and Harwich,	35	Long Pond.
Greenland Pond,	Brewster and Harwich,	37	Long Pond.
Griffiths Pond,	Brewster,	32	None.
Higgins Pond,	Brewster,	20	None.
* Long Pond,	Brewster and Harwich,	743	Brook to Hinckley Pond.
Pond northwest of same,	Brewster,	20	None.
Long Pond,	Brewster,	16	None.
Lower Pond,	Brewster,	22	Herring Brook.
Mill Pond,	Brewster,	365	Herring Brook.
No Bottom Pond,	Brewster,	54	None.
Pine Pond,	Brewster,	25	None.
Sam Hall Pond,	Brewster,	23	None.
Sheep Pond,	Brewster,	148	None.
Smalls Pond,	Brewster,	19	Long Pond.
Two ponds south of East Brewster.	Brewster,	39	None.
Walkers Pond,	Brewster,	34	None.
Emery Pond,	Chatham,	10	None.

Barnstable County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
Goose Pond,	Chatham,	66	None.
Four ponds west of same (11, 29, 13 and 14 acres).	Chatham,	67	None.
One pond east of same	Chatham,	14	None.
Lizzies Pond,	Chatham,	25	None.
Lovers Lake,	Chatham,	24	Brook.
Pond southwest of West Chatham.	Chatham,	15	None.
Stillwater Pond,	Chatham,	13	None.
Taylors Pond in southwest part.	Chatham,	14	Brook.
White Pond,	Chatham,	31	None.
Aunt Lizzie Robbins or White Pond.	Dennis and Harwich,	23	None.
Bassetts or Eagle Pond,	Dennis,	20	None.
Duck Pond,	Dennis,	10	None.
Flax Pond,	Dennis,	20	None.
Fresh Pond,	Dennis,	29	None.
Grassy Pond,	Dennis,	22	None.
Kelleys Pond,	Dennis,	25	Brook.
Run Pond,	Dennis,	20	None.
Simmons Ponds,	Dennis,	22	None.
		11	None.
Scargo Lake,	Dennis,	60	None.
Swan Pond,	Dennis,	179	Swan Pond River.
Depot Pond,	Eastham,	39	None.
Great Pond,	Eastham,	112	None
Herring Pond,	Eastham,	45	None.
Meeting House Pond,	Eastham,	17	None.
Mills Pond,	Eastham,	10	None.
Cedar Pond,	Falmouth,	25	Brook.
Coonemossett Pond,	Falmouth,	100	Coonemossett River.
Crooked Pond,	Falmouth,	73	None.
Deep Pond,	Falmouth,	34	None.
Factory Pond north of East Falmouth.	Falmouth,	19	Coonemossett River.
Pond east of same,	Falmouth,	15	Brook to Green Pond
Fresh Pond,	Falmouth,	36	None.
Jenkins Pond,	Falmouth,	42	None.
† Long Pond,	Falmouth,	205	None.
Mares Pond,	Falmouth,	38	None.

Barnstable County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
Ponds northeast of Falmouth Village (10, 11 and 16 acres).	Falmouth,	37	None.
Salt Pond,	Falmouth,	60	Brook to Nantucket Sound.
Spectacle Pond,	Falmouth,	20	Brook.
Shallow Pond,	Falmouth,	12	None.
Black Pond,	Harwich,	15	Bangs or Seymours Pond.
Grass Pond,	Harwich,	74	Doanes Creek.
Hawks Nest Pond,	Harwich,	60	None.
Pond west of same,	Harwich,	27	None.
Two ponds south of same,	Harwich,	16	None.
Island Pond,	Harwich,	21	Herring River.
Kenneys Pond,	Harwich,	26	None.
Pleasant Lake or Hinkleys Pond.	Harwich,	171	Herring River.
Paddocks Pond,	Harwich,	15	None.
Skinequit Pond,	Harwich,	20	None.
Ashumet Pond,	Mashpee and Falmouth,	214	None.
Johns Pond,	Mashpee,	240	Childs River.
Mashpee Pond,	Mashpee and Sandwich,	395	Mashpee River.
Santuit Pond,	Mashpee,	170	Santuit River.
Wakeby Pond,	Mashpee and Sandwich,	375	Connects with Mashpee River.
Bakers Pond,	Orleans and Brewster,	31	None.
Cedar Pond,	Orleans,	17	Town Cove.
Crystal Lake or Fresh Pond,	Orleans,	41	None.
Pond in south part,	Orleans,	18	None.
Sparrows Pond,	Orleans,	53	Brook to Salt Pond.
Blackwater Pond,	Provincetown,	11	None.
Clapps Pond,	Provincetown,	72	None.
Clapps Round Pond,	Provincetown,	10	None.
Duck Pond,	Provincetown,	20	None.
Great Pond,	Provincetown,	45	None.
Pasture Pond,	Provincetown,	14	None.
Shank Painter Pond,	Provincetown,	83	None.
Hoxie Pond,	Sandwich,	12	Brook to Scorton Harbor Creek.
Lawrence Pond,	Sandwich,	70	None.
Peters Pond,	Sandwich,	176	None.
Pinlico Pond,	Sandwich,	14	None.
Pond at East Sandwich,	Sandwich,	12	None.

Barnstable County — Concluded.

Name.	Town.	Approximate Area in Acres.	Outlet.
Shawme Lake,	Sandwich,	47	Mill River.
Snake Pond,	Sandwich,	76	None.
Spectacle Pond,	Sandwich,	151	None.
Triangle Pond,	Sandwich,	74	None.
Weeks Pond,	Sandwich,	12	None.
Higgins Pond,	Truro,	17	None.
Pond north of same,	Truro,	14	None.
Long Pond,	Truro,	28	None.
Mill Pond,	Truro,	17	Branch of Pamet River.
Newcombs Pond,	Truro,	32	None.
Great Pond,	Wellfleet,	42	None.
Gull Pond,	Wellfleet,	95	None.
Herring Pond,	Wellfleet,	19	Herring River.
Higgins Pond,	Wellfleet,	25	Brook to Herring River.
Hopkins Pond,	Wellfleet,	10	None.
Long Pond,	Wellfleet,	34	None.
Dennis Pond,	Yarmouth,	50	None.
Flax Pond,	Yarmouth,	20	None.
Flax Pond near West Yarmouth.	Yarmouth,	15	None.
Horse Pond,	Yarmouth,	14	None.
James Pond,	Yarmouth,	20	None.
Long Pond near South Yarmouth.	Yarmouth,	94	None.
Long Pond near Dennis Pond,	Yarmouth,	11	None.
Mill Pond,	Yarmouth,	81	Brook to Follins Pond.
Plashes Pond,	Yarmouth,	65	Parkers River.
Sandy Pond,	Yarmouth,	50	Thornton Brook.
Swan Pond,	Yarmouth,	70	Parkers River.
Taylors Pond,	Yarmouth,	39	None.
Three ponds near South Dennis (12, 10 and 13 acres).	Yarmouth,	35	None.

Berkshire County.

[Total acreage of ponds listed, about 6,226.]

Centre Lake or Pond,	Becket,	163	Branch of West Branch of Westfield River.
Greenwater Pond,	Becket,	100	Branch of Housatonic River.
Horn Pond,	Becket,	21	Branch of Walker Brook.

Berkshire County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
Rudd Pond,	Becket,	96	Brook.
Shaw Pond,	Becket and Otis,	100	Farmington River.
Ward Pond,	Becket,	22	Branch of Farmington River.
Wheeler Reservoir,	Becket,	100	Branch of West Branch of Westfield River.
Yokum Pond,	Becket,	118	Branch of West Branch of Westfield River.
Joyners Marsh Pond,	Egremont,	72	Willards Brook.
Prospect Lake,	Egremont,	140	Green River.
North Pond,	Florida,	12	Branch of Tower Brook.
Long Pond,	Great Barrington,	96	Long Pond Brook.
Mansfield Pond,	Great Barrington,	26	Branch of Housatonic River.
Berry Pond,	Hancock,	20	Branch of Kinderhook Creek.
Reservoir,	Hinsdale,	54	Branch of Housatonic River.
Pontoosuc Lake,	Lanesborough,	313	Branch of Onoto Brook.
Goose Pond,	Lee,	225	Branch of Housatonic River.
Laurel Lake,	Lee,	152	Branch of Housatonic River.
Long Pond or Upper Goose Pond.	Lee,	62	Branch of Housatonic River.
Lake Buel or Six Mile Pond,	Monterey,	344	Mill River.
Lake Garfield or Brewer Pond,	Monterey,	250	Mill River.
Lake Undine,	Mount Washington,	53	Undine Brook.
Lee Pond,	Mount Washington,	11	Lee Pond Brook.
Plantain Pond,	Mount Washington,	120	Branch of Schenob Brook.
East Pond,	New Marlborough,	104	Branch of Mill River.
Harmon Pond,	New Marlborough,	33	Brook.
Juniper Pond,	New Marlborough,	20	Branch of Mill River.
Great Lake,	Otis,	335	Branch to Otis Reservoir.
Haley Pond,	Otis,	18	Branch to Great Lake.
Hayes Pond,	Otis,	63	Hop Brook.
Larkum Pond,	Otis,	38	Branch of Farmington River.
Mill Pond west of White Lily Pond.	Otis,	25	Farmington River.
Parish Pond,	Otis,	42	Branch of Farmington River.
Pond in Otis Centre,	Otis,	24	Farmington River.
Rand Pond,	Otis,	235	Branch of Farmington River.
Pond northeast of same,	Otis,	20	Farmington River.
Pond west of same,	Otis,	95	Farmington River.
Thomas Pond,	Otis,	90	Farmington River.
Pond southwest of same,	Otis,	39	Farmington River.

Berkshire County — Concluded.

Name.	Town.	Approximate Area in Acres.	Outlet.
White Lily Pond,	Otis,	50	Brook to Great Lake.
Mill Pond near the center,	Peru,	20	Fuller Brook.
† Lake Onota,	Pittsfield,	555	Onota Brook.
Lily Pond,	Pittsfield,	20	Branch of Housatonic River.
Silver Lake,	Pittsfield,	20	Housatonic River.
Sylvan Lake,	Pittsfield,	10	Housatonic River.
Richmond Pond,	Richmond and Pittsfield.	178	Housatonic Branch.
Lower Spectacle Pond,	Sandisfield,	113	Clam River.
Pond near West Otis,	Sandisfield,	18	Clam River.
Reservoir,	Sandisfield,	53	Clam River.
Simmons Pond,	Sandisfield,	76	Branch of Farmington River.
Upper Spectacle Pond,	Sandisfield,	78	Clam River.
South Pond,	Savoy,	28	Gulf Brook.
Davis Pond,	Sheffield,	35	Williams Brook.
Pond north of same,	Sheffield,	14	Williams Brook.
Harmon Pond,	Sheffield,	20	Brook.
Mill Pond,	Sheffield,	93	Hubbards Brook.
Spur Pond,	Sheffield,	20	Brook.
Three Mile Pond,	Sheffield,	104	Iron Works Brook.
Lake Agawam,	Stockbridge,	25	Agawam Brook.
Lake Mahkenac or Stockbridge Bowl.	Stockbridge,	250	Marsh Brook.
Mohawk Lake,	Stockbridge,	23	Mohawk Brook.
† Mountain Mirror,	Stockbridge,	45	Branch of Marsh Brook.
† Ashley Lake,	Washington,	38	Ashley Brook.
Basin Pond,	Washington,	67	Housatonic River.
Benson Pond,	Washington,	27	West Branch of Westfield River.
Clapps Pond,	Washington,	10	Roaring Brook.
Muddy Pond,	Washington,	50	Branch of Housatonic River.
West Pond,	Washington,	75	Roaring Brook.
Crane Pond,	West Stockbridge,	33	Williams River.
Cranberry Pond,	West Stockbridge,	15	Williams River.
Mill Pond, Williamsville,	West Stockbridge,	13	Williams River.
Mud Pond,	West Stockbridge,	22	Williams River.
Shaker Mill Pond,	West Stockbridge,	70	Williams River.
Windsor Lake,	Windsor,	107	Branch of Westfield River.

Bristol County.

[Total acreage of ponds listed, about 8,088.]

Name.	Town.	Approximate Area in Acres.	Outlet.
† New Bedford Reservoir,	Acushnet,	280	Acushnet River.
Pond at village,	Acushnet,	16	Branch of Acushnet River.
Pond near town line,	Acushnet,	30	Branch of Mattapoisett River.
Pond near center,	Acushnet,	34	Branch of Acushnet River.
Dodgeville Pond,	Attleborough,	55	Ten Mile River.
Pond at Attleborough City,	Attleborough,	31	City Brook.
Pond at Hebronville,	Attleborough,	70	Ten Mile River.
Pond east of depot,	Attleborough,	19	Wading River.
Pond in southeast part,	Attleborough,	32	Wading River.
Pond south of Robinsonville,	Attleborough,	11	Ten Mile River.
Hicksville Pond,	Dartmouth,	23	Copecut River.
Pond at North Dartmouth,	Dartmouth,	60	Pamanset River.
Pond near Deerfield Swamp,	Dartmouth,	27	None.
Pond near Freetown line,	Dartmouth,	23	Shingle Island River.
Turners Mills Pond,	Dartmouth and New Bedford.	48	Pamanset River.
Westport Mills Pond,	Dartmouth,	127	Shingle Island River.
Pond northwest of same,	Dartmouth,	67	Shingle Island River.
Flyaway Pond,	Easton,	70	Queset Brook.
Leachs or Wilbur Pond,	Easton and Sharon,	113	Pequanticut Brook.
Lower Pond, North Easton,	Easton,	26	Queset Brook.
Morse Pond, South Easton,	Easton,	14	Queset Brook.
New Pond, Furnace Village,	Easton,	45	Mulberry Brook.
Old Pond, Furnace Village,	Easton,	12	Mulberry Brook.
Pond south of center,	Easton,	35	Black Brook.
Pond south of Furnace Village,	Easton,	10	Mulberry Brook.
Pond southeast of same,	Easton,	12	Mulberry Brook.
Shoddy Mill Pond, South Easton.	Easton,	33	Queset Brook.
Cooks Pond,	Fall River and Tiverton.	167	Brook to Mt. Hope Bay.
*†North Watuppa Pond,	Fall River and Westport.	1,851	Quequechan River.
Forge Pond,	Freetown,	60	Assonet River.
Pond in East Freetown,	Freetown,	10	Fall Brook.
Fishers Pond,	Mansfield,	19	Rumford River.
Fultons Pond,	Mansfield,	17	Rumford River.
Kingman and Hodges Pond,	Mansfield,	15	Rumford River.
Pond south of same,	Mansfield,	20	Rumford River.

Bristol County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
Murphys Pond, Mansfield Junction.	Mansfield,	10	Rumford River.
Pond in East Mansfield,	Mansfield,	30	Branch of Canoe River.
Pond south of Robinsonville,	Mansfield,	35	Wading River.
Pond southwest of West Mansfield.	Mansfield,	20	Wading River.
Pond west of Whiteville,	Mansfield,	30	Branch of Canoe River.
Robinson's Pond,	Mansfield,	10	Wading River.
Sassaquin Pond,	New Bedford,	51	Brook.
Bungay Reservoir,	North Attleborough and Mansfield.	118	Bungay River.
Pond east of village,	North Attleborough,	11	Ten Mile River.
Reservoir or Falls Pond,	North Attleborough,	140	Ten Mile River.
Pond east of same,	North Attleborough,	21	Ten Mile River.
Whiting Pond,	North Attleborough,	48	Ten Mile River.
Brass Furnace Pond,	Norton,	25	Wading River.
Norton Reservoir,	Norton and Mansfield,	615	Rumford River.
Pond at Barrowsville,	Norton,	23	Wading River.
Pond east of Barrowsville,	Norton,	20	Wading River.
Pond north of center,	Norton,	12	Rumford River.
Pond southeast of center,	Norton,	17	Rumford River.
Pond southwest of Barrowsville.	Norton,	20	Wading River.
Winneconnett Pond,	Norton,	122	Canoe River.
Forge Pond,	Raynham,	26	Two Mile River.
Pond south of same,	Raynham,	11	Two Mile River.
Gushee Pond,	Raynham,	12	Two Mile River.
Kings Pond,	Raynham,	20	Branch of Two Mile River.
Pond north of center,	Raynham,	26	Two Mile River.
Smooch Hill Pond,	Raynham,	12	Two Mile River.
Pond in southwest part,	Rehoboth,	24	Palmer River.
Pond on Swansea line,	Rehoboth,	11	Rocky River.
Reservoir,	Rehoboth,	86	Bad Luck Brook.
Pond,	Seekonk and Pawtucket.	18	Ten Mile River.
Pond in northwest corner,	Seekonk,	25	Ten Mile River.
Factory Pond,	Swansea,	20	Coles River.
Pond southwest of same,	Swansea,	20	Coles River.
Britanniaville Pond,	Taunton,	15	Mill River.
ın Factory Pond,	Taunton,	40	Taunton River.
ıace Pond,	Taunton,	125	Branch of Taunton River.

Bristol County — Concluded.

Name.	Town.	Approximate Area in Acres.	Outlet.
Hopewell Pond,	Taunton,	10	Mill Creek.
Mill Pond below Westville,	Taunton,	55	Three Mile River.
Pond at Oakland,	Taunton,	20	Three Mile River.
Pond near Myricks,	Taunton,	11	Cotley River.
Pond southwest of East Taunton.	Taunton,	23	Cotley River.
Pond south of same,	Taunton,	13	Cotley River.
Prospect Hill Pond,	Taunton and Raynham,	63	Pine Swamp Brook.
Robinson and Kings Pond,	Taunton,	30	Taunton River.
Sabbatia Lake,	Taunton,	225	Mill River.
Watsons Pond,	Taunton,	78	Connects with Sabbatia Lake.
Devols Pond,	Westport,	62	Brook to Sawdy Pond.
Sawdy Pond,	Westport and Fall River.	374	Brook to South Watuppa Pond.
* South Watuppa Pond,	Westport and Fall River.	1,773	Quequechan River.

Dukes County.

[Total acreage of ponds listed, about 1,895.]

Squibnocket Pond,	Chilmark,	628	Ocean.
Herring Pond,	Edgartown,	1,177	Canal.
Pond in east part of Nashawena.	Gosnold,	25	None.
Pond in west part of Naushon,	Gosnold,	65	None.

Essex County.

[Total acreage of ponds listed, about 4,665.]

Baileys Pond,	Amesbury,	160	Merrimac River.
Kimballs Pond or Lake Attitash.	Amesbury and Merrimac.	359	Powow River.
Pond on State line,	Amesbury,	50	Powow River.
Fosters Pond,	Andover,	40	Branch of Shawsheen River.
† Haggetts Pond,	Andover,	152	Fish Brook.
Pomps Pond,	Andover,	17	Branch of Shawsheen River.
Beaver Pond,	Beverly,	20	Branch of Miles River.
Cedar Pond,	Boxford,	13	Branch of Fish Brook.
Chadwick Pond,	Boxford and Haverhill,	177	Brook to Johnsons Pond.
Four Mile Pond,	Boxford,	42	Pye Brook.

Essex County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
Hoveys Pond,	Boxford,	36	Brook to Johnsons Pond.
*†Johnsons Pond,	Boxford and Groveland,	224	Branch of Merrimac River.
Perleys Pond,	Boxford,	54	Penn Brook.
Spoffords Pond,	Boxford,	13	Pye Brook.
Stiles Pond,	Boxford,	60	Fish Brook.
Wood Pond,	Boxford,	22	Pye Brook.
* Chebacco Lake,	Essex and Hamilton,	209	Essex River.
† Pentucket Pond,	Georgetown,	43	Parker River.
Rock Pond,	Georgetown,	43	Parker River.
Coffins Pond,	Gloucester,	12	Jones River.
Ocean Pond,	Gloucester,	35	None.
Crane Pond,	Groveland,	15	Parker River.
Becks Pond,	Hamilton,	26	Brook to Round Pond.
† Gravel Pond,	Hamilton,	47	None.
Round Pond,	Hamilton,	38	Brook to Chebacco Lake.
Chadwicks or Little Pond,	Haverhill,	107	Branch of Merrimac River.
† Creek Pond,	Haverhill,	156	Creek Brook.
† Great Pond,	Haverhill,	238	None.
Neals Pond,	Haverhill and Merrimac.	33	Branch of Merrimac River.
Plug Pond,	Haverhill,	21	Branch of Merrimac River.
Pond at River Village,	Haverhill,	14	Merrimac River.
Round Pond,	Haverhill,	41	None.
Hoods Pond,	Ipswich,	67	Branch of Pye Brook.
Pond in northwest part,	Lawrence,	12	Spicket River.
Cedar Lake,	Lynn,	35	Stony Brook.
Glenmere Lake,	Lynn,	15	Stacys Brook.
Mill Pond in west part,	Lynn,	25	Beaver Brook.
Wenuchus Lake,	Lynn,	117	Stony Brook.
Wyoma Lake,	Lynn,	84	Stony Brook.
Pillings Pond,	Lynnfield,	83	Branch of Saugus River.
† Suntaug Lake,	Lynnfield and Peabody.	148	Noyes Brook.
Beaver Dam Pond,	Manchester,	16	Bakers Brook.
Harris Pond,	Methuen,	39	Spicket River.
Mystic Pond,	Methuen,	29	Spicket River.
† Middleton Pond,	Middleton,	98	Branch of Ipswich River.
† Great Pond,	North Andover,	645	Chochechiwick River.

Essex County — Concluded.

Name.	Town.	Approximate Area in Acres.	Outlet.
† Browns Pond,	Peabody,	54	Tapleys Brook.
Cedar Pond,	Peabody,	18	Goldwaits Brook.
*†Cape Pond,	Rockport,	49	None.
Linmere Pond,	Salem,	102	Tapleys Brook.
Pond in center,	Saugus,	75	Saugus River.
Pond in north part,	Saugus,	25	Saugus River.
Cedar Pond,	Wenham,	16	None.
Coys Pond,	Wenham,	36	Brook to Round Pond.
Muddy Pond,	Wenham,	18	None.
Pleasant Pond,	Wenham and Hamilton,	38	Branch of Ipswich River.
*†Wenham Lake,	Wenham and Beverly,	251	Miles River.
† Langham Reservoir,	Wenham and Beverly,	43	Miles River.
Crane Neck Pond,	West Newbury,	10	Parker River.

Franklin County.

[Total acreage of ponds listed, about 2,070.]

Great Pond,	Ashfield,	60	South River.
Pond in south part,	Ashfield,	13	Swift River.
Williams Pond,	Ashfield,	26	Swift River.
Pond in Foundry Village,	Colrain,	15	North River.
City Pond,	Conway,	25	Swift River.
Otter Pond,	Gill,	14	Otter Pond Brook.
Pond near center,	Gill,	17	Unadilla Brook.
Fish Pond,	Leverett,	33	Roaring Brook.
Greenfield Aqueduct Pond,	Leyden,	13	Buddington Creek.
Green Pond,	Montague,	13	None.
† Lake Pleasant,	Montague	52	Pond Brook.
Eagleville Reservoir,	New Salem, Orange and Athol.	206	Branch of Millers River.
Hackers Pond,	New Salem,	15	Brook to Thompson Pond.
Hop Brook Pond,	New Salem,	20	Brook to Neeseponset Pond.
Millington Mill Pond,	New Salem,	12	Brook to Neeseponset Pond.
Nance Lake,	New Salem,	13	None.
Spectacle Pond,	New Salem,	90	Brook to Hackers Pond.
Thompsons Pond,	New Salem,	235	Brook to Neeseponset Pond.
Pond north of same,	New Salem,	30	Brook to Neeseponset Pond.
Lily Pond,	Northfield,	16	Bennetts Brook.

Franklin County — Concluded.

Name.	Town.	Approximate Area in Acres.	Outlet.
Pond,	Northfield and Irving,	16	Keyup Brook.
Pond near Cragg Mountain,	Northfield,	15	Keyup Brook.
Sawyers Pond,	Northfield,	15	Bennetts Brook.
Pond near same,	Northfield,	13	Keyup Brook.
North Pond,	Orange,	78	Middle Branch of Swift River.
Packard Pond,	Orange,	40	Tully River.
Stowells Pond,	Orange,	66	Tully River.
Reservoir Pond,	Rowe,	75	Pelham Brook.
Locks Pond,	Shutesbury,	127	Saw Mill Brook.
Pond near Dudleyville,	Shutesbury,	20	Saw Mill Brook.
Cranberry Pond,	Sunderland,	22	Cranberry Brook.
Bass Reservoir,	Warwick,	50	Mill Brook.
Pond southwest of same,	Warwick,	57	Mill Brook.
Delvas Pond,	Warwick,	20	Moss Brook.
Pond west of same,	Warwick,	60	Moss Brook.
Harris Pond,	Warwick,	118	Moss Brook.
Hastings Pond,	Warwick,	27	Hodge Brook.
Pond east of same,	Warwick,	26	Gales Brook.
Lake Moore,	Warwick,	25	Moss Brook.
Long Pond,	Warwick,	84	Brook to Harris Pond.
Lower Pond on Tully Brook,	Warwick,	10	Tully River.
Upper Pond on Tully Brook,	Warwick,	30	Tully River.
Pond near New Hampshire line.	Warwick,	15	Valley Brook.
Pond near southeast corner,	Warwick,	56	Orcutts Brook.
Pond northeast of center,	Warwick,	11	Gales Brook.
Pond north of center,	Warwick,	15	Brook to Pond.
Mill Pond in west part,	Wendell,	15	Osgood Brook.
Pond in northwest part,	Wendell,	15	Osgood Brook.
Wickett Pond,	Wendell,	83	Wickett Brook.

Hampden County.

[Total acreage of ponds listed, about 4,233.]

Mill Pond in southeast part,	Agawam,	11	Connecticut River.
Mill Pond in southwest part,	Agawam,	11	Still Brook.
Blair Pond,	Blandford,	215	Pond Brook.

Hampden County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
Long Pond,	Blandford,	150	Pond Brook.
North Meadow Pond,	Blandford,	80	Pebble Brook.
Bakers Pond,	Brimfield,	16	Brook to Long Pond.
Grape Pond,	Brimfield,	95	Town Brook.
Little Alum Pond,	Brimfield,	134	Branch of Quinnebaug River.
Pond southwest of center,	Brimfield,	13	Brook.
Slabbery Pond,	Chicopee,	69	None.
Slipe Pond,	Chicopee,	114	None.
Smooth Pond,	Chicopee,	10	None.
Back Pond,	Granville,	28	Bowden Brook.
Parsons Pond,	Granville,	12	Pond Brook.
Hamilton Reservoir,	Holland,	331	Brook to Holland Pond.
Holland Pond,	Holland,	64	Quinnebaug River.
† Ashley Pond,	Holyoke,	178	Black Brook.
Hitchcock Pond,	Holyoke,	58	Brook to Ashley Pond.
† Chapins Pond,	Ludlow,	45	None.
Mill Pond below village,	Ludlow,	75	Chicopee River.
Minechoag Pond,	Ludlow,	18	None.
Pickerel Pond,	Ludlow,	11	None.
Pond in north part,	Ludlow,	13	Branch to Broad Brook.
Pond in west part,	Ludlow,	11	None.
Woods Pond,	Ludlow,	31	None.
Pond in center,	Monson,	11	Branch of Quaboag River.
Shatterack Pond,	Montgomery,	17	Shatterack Brook.
Calkins Pond,	Palmer,	32	Ware River.
Forest Lake,	Palmer,	50	Ware River.
Pattaquattic Pond,	Palmer,	15	Ware River.
Pond west of Thorndike,	Palmer,	13	Ware River.
Hassards Pond,	Russell,	60	Branch of Westfield River.
Congamond Lake,	Southwick,	592	Great Brook.
Bass Pond,	Springfield,	24	None.
† Five Mile Pond,	Springfield,	96	None.
Pond west of same,	Springfield,	26	None.
Lake Como,	Springfield,	10	None.
Loon Pond,	Springfield,	18	North Branch of Mill River.
Pond at Indian Orchard,	Springfield,	15	None.

Hampden County — Concluded.

Name.	Town.	Approximate Area in Acres.	Outlet.
Water Shop Pond,	Springfield,	328	Mill River.
Cranberry Pond,	Tolland,	17	Cranberry Pond Brook.
Halls Pond,	Tolland,	33	Hubbard Brook.
Messenger or Cotton Pond,	Tolland and Otis,	580	Farmington River.
Noyes Pond,	Tolland,	276	Pond Brook.
Wales Pond,	Wales,	66	Wales Brook.
Buck Pond,	Westfield,	30	Pond Brook.
Horse Pond,	Westfield,	45	Pond Brook.
Nine Mile Pond,	Wilbraham,	36	North Branch of Mill River.
Pond in center,	Wilbraham,	30	South Branch of Mill River.
Spectacle Pond,	Wilbraham,	20	None.

Hampshire County.

[Total acreage of ponds listed, about 2,282.]

Pond at Mill Valley,	Amherst,	23	Fort River.
Pond in east part,	Amherst,	11	None.
Pond in North Amherst,	Amherst,	15	Mill River.
Knights Pond,	Belchertown,	17	Jabish River.
Lower Pond,	Belchertown,	90	Brook to Forge Pond.
Middle Pond,	Belchertown,	40	Brook to Forge Pond.
Mill Pond near Granby line,	Belchertown,	10	Brook to Forge Pond.
Mill Pond southeast from railroad station.	Belchertown,	22	Jabish Brook.
Damons or Burnell Pond,	Chesterfield,	37	Dead Branch.
Lower Mill Pond,	Easthampton,	35	Manhan River.
Upper Mill Pond,	Easthampton,	53	Manhan River.
Morton Pond,	Enfield,	20	Beaver Brook.
Train Pond,	Enfield,	13	Beaver Brook.
Dresser Pond,	Goshen,	44	The Branch.
Lily Pond,	Goshen,	57	Dead Branch.
Reservoir,	Goshen,	100	Mill Brook.
Forge Pond,	Granby,	115	Bachelor Brook.
Pond north of center,	Granby,	30	Bachelor Brook.
Bullhead Pond,	Greenwich,	23	None.
Curtis Pond,	Greenwich,	155	Branch of Middle Branch of Swift River.
Davis Pond,	Greenwich,	100	Branch of Middle Branch of Swift River.
Flask Pond,	Greenwich,	18	Branch of Middle Branch of Swift River.

Hampshire County — Concluded.

Name.	Town.	Approximate Area in Acres	Outlet.
Luce Pond,	Greenwich,	124	Branch of Middle Branch of Swift River.
Pond in village,	Greenwich,	30	East Branch of Swift River.
West Pond,	Greenwich,	94	East Branch of Swift River.
Pond east of North Hadley,	Hadley,	48	Mill River.
Pond north of Plainville,	Hadley,	49	Mill River.
Pond southeast of village,	Hadley,	40	Fort River.
Great Pond,	Hatfield,	23	Connecticut River.
Pond north of same,	Hatfield,	17	Branch of Connecticut River.
Pond in west part,	Hatfield,	20	Branch of Mill River.
Norwich Pond,	Huntington,	128	Pond Brook.
Pond near center,	Middlefield,	12	West Branch of Westfield River.
Danks Pond,	Northampton and Easthampton.	80	Connecticut River.
Crooked Pond,	Plainfield,	21	Brook to Windsor Lake.
Plainfield Pond,	Plainfield,	45	Kings Brook.
Pond on Hawley line,	Plainfield,	25	Kings Brook.
Gibbs Pond,	Prescott,	22	Middle Branch of Swift River.
Hackmetack Pond,	Prescott and Greenwich,	15	Middle Branch of Swift River.
Mill Pond northwest of same.	Prescott,	13	Middle Branch of Swift River.
The Hollow Pond,	Prescott,	154	West Branch of Swift River.
Pond north of same,	Prescott,	17	Middle Branch of Swift River.
Lower Pond in village,	South Hadley,	16	Stony Brook.
Upper Pond in village,	South Hadley,	12	Stony Brook.
Pond in north part,	South Hadley,	16	Stony Brook.
Taylor Pond,	South Hadley,	15	None.
Hampton Pond,	Southampton and Westfield.	197	Pond Brook.
Pond in south part,	Westhampton,	11	Sodden Brook.
Reservoir or Hanging Mountain Pond.	Westhampton,	10	Branch of North Brook.

Middlesex County.

[Total acreage of ponds listed, about 8,982.]

Grassy Pond,	Acton,	33	Long Pond Brook.
Pond in northeast part,	Acton,	11	Nashoba Brook.
Pond in southeast part,	Acton,	10	None.
Mystic Lakes,	Arlington and Winchester.	232	Mystic River.
* Pond southwest of same,	Arlington,	13	Mystic River.

Middlesex County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
Spy Pond,	Arlington,	120	Branch of Alewife Brook.
Reservoir,	Ashby,	87	Willard Brook.
Wrights Ponds,	Ashby,	22	Pearl Hill Brook.
Pond in center,	Ashland,	18	Sudbury River.
Pond in west part,	Ashland,	16	Sudbury River.
Pond southeast of same,	Ashland,	18	Sudbury River.
Fletcher Pond,	Ayer,	115	Nonacoicus Brook.
Long Pond,	Ayer,	45	Nonacoicus Brook.
Plow Shop Pond,	Ayer,	45	Nonacoicus Brook.
Pond in southeast corner,	Ayer,	10	South or Bennetts Brook.
Sandy Pond,	Ayer,	80	Nonacoicus Brook.
Spectacle Pond,	Ayer and Littleton,	79	Bennetts Brook.
Ice Pond,	Belmont,	35	Mystic River.
Little Spy Pond,	Belmont,	34	Branch of Alewife Brook.
Nuttings Pond,	Billerica,	90	Branch of Concord River.
Winnings Pond,	Billerica,	10	Branch of Concord River.
Withington Pond,	Boxborough,	37	Assabet Brook.
Pond on Lexington line,	Burlington,	10	Vine Brook.
† Fresh Pond,	Cambridge,	175	Alewife Brook.
Hart Pond,	Chelmsford,	105	Meadow Brook.
Newfield Pond,	Chelmsford,	80	Canal to Stony Brook.
Batemans Pond,	Concord,	20	Spencer Brook.
Fairhaven Bay,	Concord and Lincoln,	60	Sudbury River.
Lake Walden,	Concord,	65	None.
White Pond,	Concord,	53	None.
Long Pond,	Dracut, Tyngsborough and Pelham.	114	Double Brook.
Merrimac Mills Pond,	Dracut,	12	Merrimac River.
Peters Pond,	Dracut,	104	Bartletts Brook.
† Farm Pond,	Framingham,	168	Sudbury River.
Gleasons Pond,	Framingham,	10	Steep Brook.
Learneds Pond,	Framingham,	42	None.
Waushakum Pond,	Framingham and Ashland.	91	Steep Brook.
Baddacook Pond,	Groton,	103	Baddacook Brook.
Dick Pond,	Groton,	55	None.
Knops Pond,	Groton,	55	Branch of Martins Pond Brook.
Martins Pond,	Groton,	31	Martins Pond Brook.

Middlesex County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
Massapoag Pond,	Groton, Dunstable and Tyngsborough.	143	Salmon Brook.
Lake Winthrop,	Holliston,	125	Jar Brook.
Pond at East Village,	Holliston,	24	Jar Brook.
Pond southeast of same,	Holliston,	14	Jar Brook.
North Pond,	Hopkinton, Milford and Upton.	243	Mill River.
Whitehall Reservoir,	Hopkinton,	620	Sudbury River.
† White Pond,	Hudson,	46	Assabet River.
Beaver Pond,	Lincoln,	112	Branch of Stony Brook.
*†Sandy Pond,	Lincoln,	114	Stony Brook.
Two ponds in northwest part,	Lincoln,	30	Hobbs Brook.
		20	None.
Fort Pond,	Littleton,	104	Fort Pond Brook.
Long Pond,	Littleton,	78	Brook to Fort Pond.
Mill Pond,	Littleton,	40	Beaver Brook.
*†Nagog Pond,	Littleton and Acton,	283	Nagog Brook.
Spectacle Pond,	Littleton and Ayer,	71	Stony Brook.
Pond in center,	Malden,	10	Malden River.
Fort Meadow Reservoir,	Marlborough,	250	Fort Meadow Brook.
† Williams Pond,	Marlborough,	100	Milham Brook.
Assabet Mill Pond,	Maynard,	19	Assabet River.
Puffers Pond,	Maynard and Sudbury,	30	Assabet River.
Crystal Lake or Ell Pond,	Melrose,	30	Malden River.
Long Pond,	Melrose,	10	Saugus River.
Dug Pond,	Natick,	46	Brook to Lake Cochituate.
Jennings Pond,	Natick,	11	Brook to Morses Pond.
† Lake Cochituate,	Natick, Framingham and Wayland.	690	Cochituate Brook.
Nonesuch Pond,	Natick and Weston,	39	Brook to Morses Pond.
Pickerel Pond,	Natick,	10	Brook to Mud Pond.
Pond on Steep Brook,	Natick,	12	Brook to Lake Cochituate.
Reservoir Pond,	Natick,	58	Brook to Lake Cochituate.
Hammonds Pond,	Newton,	28	Branch of Charles River.
Silver Lake,	Newton,	12	None.
Wiswalls Pond,	Newton,	27	None.
Martins Pond,	North Reading,	136	Martins Brook.
Pond on Ipswich line,	North Reading,	23	Branch of Ipswich River.
Swam Pond,	North Reading,	86	Branch of Ipswich River.

Middlesex County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
Farm Pond,	Sherborn,	100	Branch of Charles River.
Dead Pond,	Shirley,	16	None.
Pond northeast of same,	Shirley,	22	Catacunemug Brook.
Paper Mill Pond,	Shirley,	44	Squannacook River.
Squannacook Pond,	Shirley,	13	Squannacook River.
Doleful Pond,	Stoneham,	13	Malden River.
* Spot Pond,	Stoneham,	220	Malden River.
Boons Pond,	Stow and Hudson,	100	Assabet River.
Pond in Assabet River,	Stow,	283	Assabet River.
Blandford Pond,	Sudbury,	22	Wash Brook.
Pond north of same,	Sudbury,	11	Wash Brook.
Bottomless Pond,	Sudbury,	21	None.
Pond on Hop Brook,	Sudbury,	13	Hop Brook.
Willis Pond,	Sudbury,	74	Run Brook.
Long Pond,	Tewksbury,	43	Content Brook.
Round Pond,	Tewksbury,	28	Strongwater Brook.
Harbor Pond,	Townsend,	95	Squannacook River.
Pond southwest of same,	Townsend,	12	Branch of Squannacook River.
Reservoir,	Townsend,	22	Squannacook River.
Massapoag Pond,	Tyngsborough, Dunstable and Groton.	56	Salmon Brook.
Pond south of same,	Tyngsborough and Groton.	12	Salmon Brook.
Mud Pond,	Tyngsborough,	46	Branch of Lawrence Brook.
* Tyngs Pond,	Tyngsborough and Dracut.	228	Branch of Lawrence Brook.
*†Crystal Lake,	Wakefield,	48	Saugus River.
* Lake Quannapowitt,	Wakefield,	254	Saugus River.
Hardys Pond,	Waltham,	52	Beaver Brook.
Dudley Pond,	Wayland,	86	None.
Heards Pond,	Wayland,	82	Sudbury River.
Burges Pond,	Westford,	22	Branch of Keyes Brook.
Flushing Pond,	Westford,	13	Brook to Nabnassett Pond.
Forge Pond,	Westford, Littleton and Groton.	211	Stony Brook.
Nabnassett Pond,	Westford,	98	Branch of Stony Brook.
Keyes Pond,	Westford,	20	Keyes Brook.
Sought for Pond,	Westford,	106	Branch of Spaulding Brook.
Silver Lake,	Wilmington,	37	Lubber Brook.
Pond in northeast part,	Winchester,	15	Mystic River.

Middlesex County — Concluded.

Name.	Town.	Approximate Area in Acres.	Outlet.
Wedge Pond,	Winchester,	67	Mystic River.
Winter Pond,	Winchester,	24	None.
Horn Pond,	Woburn,	91	Mystic River.
Pond at East Woburn,	Woburn,	14	Abajona River.
Pond in northwest part,	Woburn,	10	Maple Meadow Brook.
Richardson Pond,	Woburn,	31	Mystic River.

Nantucket County.

[Total acreage of ponds listed, about 33.]

Gibbs Pond,	Nantucket,	33	None.

Norfolk County.

[Total acreage of ponds listed, about 4,235.]

Beaver Pond,	Bellingham,	108	Charles River.
Jenks Reservoir,	Bellingham,	42	Peters River.
Pond north of Bellingham Center.	Bellingham,	18	Charles River.
Pond west of Bellingham Center.	Bellingham,	27	Charles River.
Pond northeast of North Bellingham.	Bellingham,	10	Charles River.
Pond northwest of North Bellingham.	Bellingham,	12	Charles River.
Pond south of North Bellingham.	Bellingham,	93	Charles River.
Cranberry Pond,	Braintree,	25	Cranberry Brook.
† Great Pond,	Braintree,	204	Farm River.
Brookline Reservoir,	Brookline,	23	Boston Water Works.
Ames Pond,	Canton,	20	Pequid Brook.
Forge Pond,	Canton,	26	Pequid Brook.
Muddy Pond,	Canton,	10	None.
Ponkapoag Pond,	Canton and Randolph,	209	Ponkapoag Brook.
Reservoir Pond,	Canton,	209	Massapoag Brook.
Scituate Pond,	Cohasset,	53	None.
Mill Pond in south part,	Dedham,	20	Bubbling Brook.
Sprague Pond,	Dedham and Boston,	11	None.
Wigwam Pond,	Dedham,	32	Branch of Charles River.
Reserve Pond,	Dover,	25	Noanets Brook.
Cocasset Pond,	Foxborough,	40	Cocasset River.
Pond south of same,	Foxborough,	22	Cocasset River.
Reservoir northwest of same.	Foxborough,	25	Cocasset River.

Norfolk County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
Neponset Reservoir,	Foxborough,	365	Neponset River.
Pond near East Foxborough,	Foxborough,	13	Rumford River.
Pond near South Walpole,	Foxborough,	14	Brook to Neponset Reservoir.
Pond northeast of Shepards Pond.	Foxborough,	14	Cocasset River.
Pond northwest of center,	Foxborough,	62	Brook to Cocasset River.
Reservoir south of same,	Foxborough,	28	Cocasset River.
Pond southeast of center,	Foxborough,	12	Rumford River.
Two ponds west of Neponset Reservoir.	Foxborough,	22	Cocasset River.
Witch Pond,	Foxborough and Mansfield.	12	None.
† Beaver Pond,	Franklin,	18	Mine Brook.
Pond north of same,	Franklin,	31	Mine Brook.
Dr. Millers Reservoir,	Franklin,	25	Mill River.
Uncas Pond,	Franklin,	12	Brook to Whiting Pond.
Boggastow Pond,	Millis,	26	Boggastow Brook.
Houghton Pond,	Milton,	28	Blue Hill River.
Pond near center,	Needham,	20	Rosemary Brook.
Reservoir near center,	Needham,	27	Charles River.
Brush Factory Pond,	Norfolk,	14	Mill River.
City Mills Pond,	Norfolk,	12	Mill River.
Kingsbury Pond,	Norfolk,	20	None.
Pond south of center,	Norfolk,	14	Stony Brook.
Populatic Pond,	Norfolk,	48	Charles River.
Miramichi or Shepards Pond,	Plainville and Foxborough.	173	Wading River.
Pond northeast of Shepardville Reservoir.	Plainville,	17	Wading River.
Shepardville Reservoir,	Plainville,	20	Wading River.
Billings Pond,	Sharon,	10	Rumford River.
Massapoag Lake,	Sharon,	460	Massapoag Brook.
Pond,	Sharon and Foxborough.	10	Pecuanticiot Brook.
Reservoir Pond,	Sharon,	17	Pecuanticiot Brook.
Wolomolopoag Pond,	Sharon,	36	Rumford River.
Glen Echo Lake,	Stoughton and Canton,	17	Beaver Brook.
Long Pond,	Stoughton and Easton,	127	Queset Brook.
Muddy Pond,	Stoughton,	10	Massapoag Brook.
Pond west of center,	Stoughton,	19	Massapoag Brook.
Pond northwest of same,	Stoughton,	10	Massapoag Brook.
Pond at East Walpole,	Walpole,	21	Neponset River.

Norfolk County — Concluded.

Name.	Town.	Approximate Area in Acres.	Outlet.
Pond northwest of center,	Walpole,	23	Neponset River.
Lake Waban,	Wellesley,	120	Waban Brook.
Morses Pond,	Wellesley and Natick,	115	Brook to Lake Waban.
*†Buckmaster Pond,	Westwood,	31	Hawes Brook.
Pond in northwest part,	Westwood,	10	Branch of Charles River.
† Great Pond,	Weymouth,	228	Mill River.
Whitmans Pond,	Weymouth,	247	Weymouth Back River.
Whortleberry Pond,	Weymouth,	12	Branch of Mill River.
Archers Pond,	Wrentham,	94	None.
Lake Pearl or Whitings Pond,	Wrentham,	244	Mill River.
Marsh Pond,	Wrentham,	63	Stony Brook.

Plymouth County.

[Total acreage of ponds listed, about 17,414.]

Clevelands Pond,	Abington,	11	Beaver Brook.
Island Grove Pond,	Abington,	49	Shumatuscacant River.
Whitman Reservoir,	Abington and Whitman,	25	Bear Meadow Brook.
Carvers Pond,	Bridgewater,	42	South Brook.
Nippenicket Pond,	Bridgewater,	352	Town River.
Nunkets Pond,	Bridgewater and Raynham.	16	Taunton River.
Pond in northeast part,	Bridgewater,	33	Taunton River.
Pond in southwest part,	Bridgewater,	14	Taunton River.
Salisbury Lake,	Brockton,	10	Salisbury Plain River.
Wheelers or Cross Pond,	Brockton,	25	Salisbury Plain River.
Barretts Pond,	Carver,	12	None.
Bates Pond,	Carver,	20	None.
Cedar Pond,	Carver,	30	None.
* Coopers Pond,	Carver,	40	None.
* Dunhams Pond,	Carver,	40	Sampsons Brook.
East Head Pond,	Carver and Plymouth,	104	Wankinco River.
Factory Pond,	Carver,	55	Sampsons Brook.
Federal Furnace Pond,	Carver and Plymouth,	100	Sampsons Brook.
* Johns Pond,	Carver,	16	Green Brook.
Muddy Pond,	Carver,	50	Winetuxet Brook.

Plymouth County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
* Sampsons Pond,	Carver,	234	Sampsons Brook.
* Vaughan Pond,	Carver,	13	Beaver Dam Brook.
Wenham Pond,	Carver,	50	Herring Brook.
* Island Creek Pond,	Duxbury,	72	Island Creek.
Pond in northwest part,	Duxbury,	10	Branch of South River.
Round Pond,	Duxbury,	11	Brook.
Lower Pond northeast of village.	East Bridgewater,	20	Meadow Brook.
Middle Pond northeast of village.	East Bridgewater,	14	Meadow Brook.
Pond northeast of Elmwood,	East Bridgewater,	15	Satucket River.
Pond in northwest part,	East Bridgewater,	19	Beaver Brook.
Pond south of above,	East Bridgewater,	23	Beaver Brook.
Pond west of center,	East Bridgewater,	20	Beaver Brook.
Robbins Pond,	East Bridgewater,	140	Satucket River.
Pond north of above,	East Bridgewater,	11	Black Brook.
Upper Pond northeast of village.	East Bridgewater,	16	Meadow Brook.
Monponsett Pond,	Halifax and Hanson,	742	Satucket River.
Pond south of above,	Halifax,	31	Winetuxet River.
Mud Pond near line of Pembroke.	Halifax,	20	None.
Pond in south corner,	Halifax,	29	Winetuxet River.
Pond north of above,	Halifax,	45	Winetuxet River.
Pond in southwest part,	Halifax,	14	Winetuxet River.
Pond in northwest part,	Hanover,	13	Drinkwater River.
Pond in southwest part,	Hanover,	24	Indian Head River.
* Indian Head Pond,	Hanson,	125	Indian Head Brook.
* Maquan Pond,	Hanson,	45	Brook to Indian Head Pond.
Pond,	Hanson and Hanover,	27	Indian Head River.
Pond at North Hanson,	Hanson,	40	Branch of Poor Meadow Brook.
Pond southwest of above,	Hanson,	46	Branch of Poor Meadow Brook.
Wampatuck Pond,	Hanson,	81	Indian Head Brook.
† Accord Pond,	Hingham, Norwell and Rockland.	101	Weir River.
Cushing Pond,	Hingham,	30	Branch of Weir River.
Fulling Mill Pond,	Hingham,	18	Branch of Weir River.
Triphammer Pond,	Hingham,	12	Branch of Weir River.
Blackwater Pond,	Kingston,	29	Pine Brook.
Crossmans Pond,	Kingston,	15	Pine Brook.
Pond southeast of same,	Kingston,	15	Furnace Brook.

Plymouth County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
* Great Indian Pond,	Kingston and Plympton.	62	None.
Muddy Pond,	Kingston,	61	None.
Pond near corner of Duxbury and Pembroke.	Kingston,	10	Pine Brook.
Smelt Pond,	Kingston,	92	Smelt Brook.
*†Assowompsett Pond,	Lakeville,	2,121	Nemasket River.
Clear Pond,	Lakeville,	21	None.
Dunhams Pond,	Lakeville,	10	None.
*†Elders Pond,	Lakeville,	167	Brook.
*†Great Quittacas Pond,	Lakeville and Rochester.	1,132	Connects with Pocksha Pond.
*†Little Quittacas Pond,	Lakeville and Rochester.	314	Connects with Great Quittacas Pond.
Long Pond,	Lakeville and Freetown,	1,713	Connects with Assowompsett Pond.
Loon Pond,	Lakeville,	20	None.
* Pocksha Pond,	Lakeville and Middleborough.	489	Connects with Assowompsett Pond.
Pond north of T. & M. Branch of New York, New Haven & Hartford Railroad.	Lakeville,	11	Poquoy Trout Brook.
Pond near Lawrence Swamp,	Marion,	12	Mill Creek.
Pond south of South Marshfield.	Marshfield,	16	South River.
Pond near Acushnet line,	Mattapoisett,	30	Mattapoisett River.
Bensons Pond,	Middleborough,	29	Branch of Weweantitt River.
Pond north of above,	Middleborough and Carver.	14	Weweantitt River.
Pond in Waterville,	Middleborough,	27	Whetstone Brook.
Tispaquin Pond,	Middleborough,	175	Fall Brook.
Woods Pond,	Middleborough,	45	Woods Brook.
Black Pond,	Norwell,	17	Second Herring Brook.
Dead Swamp Pond,	Norwell,	33	Second Herring Brook.
Jacobs Pond,	Norwell, Hanover and Pembroke.	53	Third Herring Brook.
Pond,	Norwell,	12	Second Herring Brook.
Furnace Pond,	Pembroke,	120	Herring Brook.
† Great Sandy Bottom Pond,	Pembroke,	100	Herring Brook.
Hobomack Pond,	Pembroke,	15	None.
* Little Sandy Bottom Pond,	Pembroke,	65	Brook to Great Sandy Bottom Pond.
Lower Pond,	Pembroke and Duxbury.	39	Pine Brook.
Lower Pond,	Pembroke and Hanover.	16	North River.
Oldham Pond,	Pembroke,	230	Herring Brook.
Pond northeast of center,	Pembroke,	11	Herring River.
*†Silver Lake,	Pembroke,	728	Jones River.

Plymouth County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
* Stetson Pond,	Pembroke,	93	Brook to Monponsett Pond.
Upper Pond,	Pembroke and Duxbury.	13	Brook to Lower Pond.
Upper Pond,	Pembroke and Hanover.	25	North River.
Beaver Dam Pond,	Plymouth,	115	Beaver Dam Brook.
Big Sandy Pond,	Plymouth,	121	None.
* Billington Sea,	Plymouth,	306	Town Brook.
* Bloody Pond,	Plymouth,	93	None.
† Boot Pond,	Plymouth,	74	None.
Bumps Pond,	Plymouth,	16	None.
* Charge Pond,	Plymouth,	45	None.
Clam Pudding Pond,	Plymouth,	10	None.
* Clear Pond,	Plymouth,	12	None.
Clew Pond,	Plymouth,	50	None.
College Pond,	Plymouth,	50	None.
* Cooks Pond,	Plymouth,	21	None.
* Darby Pond,	Plymouth,	51	None.
Dunham Pond,	Plymouth,	12	None.
Ellis Pond,	Plymouth,	19	None.
Ezekiels Pond,	Plymouth,	38	None.
* Fawn Pond,	Plymouth,	20	None.
Fearings Pond,	Plymouth,	65	None.
Federal Furnace Pond,	Plymouth,	48	Sampsons Brook.
* Fresh Pond,	Plymouth,	57	None.
* Five Mile Pond,	Plymouth,	23	None.
Gallows Pond,	Plymouth,	43	None.
Grassy Pond,	Plymouth,	14	None.
Great Herring Pond,	Plymouth,	435	Monument River.
*† Great South Pond,	Plymouth,	318	Eel River.
* Gunners Exchange Pond,	Plymouth,	98	None.
* Half Way Pond,	Plymouth,	223	Agawam River.
* Island Pond,	Plymouth,	82	None.
Jenkins Hole,	Plymouth,	19	None.
Kings Pond,	Plymouth,	15	None.
Little Herring Pond,	Plymouth,	70	Brook to Great Herring Pond.
* Little Long Pond,	Plymouth,	54	Brook to Long Pond.
Little Sandy Pond,	Plymouth,	11	None.

Plymouth County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
† Little South Pond,	Plymouth,	54	Brook to Great South Pond.
Long Pond near Three-cornered Pond.	Plymouth,	44	None.
† Lout Pond,	Plymouth,	18	None.
Little Island Pond,	Plymouth,	15	Brook to Beaver Dam Pond.
* Long Pond,	Plymouth and Wareham.	13	None.
Long Pond near Half Way Pond.	Plymouth,	240	None.
Micajahs Pond,	Plymouth,	10	None.
Muddy Pond,	Plymouth,	14	None.
North Triangle Pond,	Plymouth,	10	None.
Old Colony Duck Company Pond.	Plymouth,	14	Eel River.
Rocky Pond,	Plymouth,	32	None.
Russell Mills Pond,	Plymouth,	52	Eel River.
Saverys Pond,	Plymouth,	56	None.
Shallow Pond,	Plymouth,	15	None.
South Triangle Pond,	Plymouth,	20	None.
Three-cornered Pond,	Plymouth,	20	None.
West Pond,	Plymouth,	75	None.
White Island Pond,	Plymouth and Wareham.	396	Red Brook.
Wiggins Pond,	Plymouth,	25	Red Brook.
Pond northwest of above,	Plymouth,	15	None.
Pond in south corner,	Plympton,	25	Whetstone Brook.
Hathaways Pond,	Rochester,	96	Sippican River.
Leonards Pond,	Rochester,	59	Sippican River.
Long Pond,	Rochester,	33	None.
* Marys Pond,	Rochester and Marion,	92	Branch of Sippican River.
Snipatuit Pond,	Rochester,	885	Mattapoisett River.
Snows Pond,	Rochester,	82	None.
Pond southwest of above,	Rochester,	76	Mattapoisett River.
Spring Lake,	Rockland,	32	Indian Head River.
Bartletts Marsh Pond,	Wareham,	55	Brook.
Beaver Dam Pond,	Wareham,	20	None.
* Blackmore Pond,	Wareham,	55	Branch of Hammond Brook.
Pond north of above,	Wareham,	92	Weweantitt River.
Pond northwest of preceding,	Wareham,	23	Weweantitt River.
* Cedar Pond,	Wareham,	13	Brook to Spectacle Pond.
Flax Pond,	Wareham,	31	None.
Pond northwest of above,	Wareham,	112	Agawam River.

Plymouth County — Concluded.

Name.	Town.	Approximate Area in Acres.	Outlet.
Glen Charlie Pond,	Wareham,	65	Agawam River.
Mosquito Pond,	Wareham,	20	Brook.
* Pickerel Pond,	Wareham,	23	None.
Pond near Wareham Narrows,	Wareham,	62	Wankinco River.
Pond south of West Wareham,	Wareham,	23	Weweantitt River.
Pond southeast of above,	Wareham,	28	Weweantitt River.
* Spectacle Pond,	Wareham,	85	Agawam River.
† Sturtevants Pond,	Wareham,	13	None.
Swifts Pond,	Wareham,	50	Brook to Onset Bay.
Tihonet Pond,	Wareham,	97	Wankinco River.
West Wareham Pond,	Wareham,	45	Weweantitt River.

Suffolk County.

[Total acreage of ponds listed, about 68.]

Mill Pond, Readville,	Boston,	12	Mother Brook.
Jamaica Pond,	Boston,	56	None.

Worcester County.

[Total acreage of ponds listed, about 24,479 acres.]

Lower Naukeag Pond,	Ashburnham,	150	Branch of Millers River.
Mud Pond,	Ashburnham,	23	Branch of Millers River.
Nashua Reservoir,	Ashburnham and Gardner.	300	Branch of Millers River.
Pond at Ashburnham Junction.	Ashburnham,	16	Brook.
Pond at South Ashburnham,	Ashburnham,	28	Whitmans River.
Pond in northwest part,	Ashburnham,	16	Bear Meadow Brook.
Reservoir near Mt. Hunger,	Ashburnham,	75	Phillips Brook.
Pond north of above,	Ashburnham,	16	Phillips Brook.
Stodge Meadow Pond,	Ashburnham,	58	Phillips Brook.
Upper Naukeag Pond,	Ashburnham,	302	Brook to Lower Naukeag Pond.
Ward Pond,	Ashburnham,	54	Brook to Watatic Pond.
Watatic Pond,	Ashburnham and Ashby.	52	Souhegan River.
Babcock Pond,	Athol,	44	Millers River.
Pond south of Athol Center,	Athol,	25	Branch of Millers River.
White Pond,	Athol,	100	Branch of Millers River.
Pond south of above,	Athol,	65	Branch of Millers River.

Worcester County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
Dunns Pond,	Auburn,	28	Brook.
Eddy Pond,	Auburn,	40	Dark Brook.
Pond east of center,	Auburn,	30	Brook to Dunns Pond.
Pond northeast of Stoneville,	Auburn and Worcester,	175	Brook to Curtis Pond.
Stoneville Reservoir,	Auburn,	48	Kettle Brook.
Pond northeast of above,	Auburn,	30	Kettle Brook.
Pond southeast of center,	Barre,	20	Prince River.
Reservoir,	Barre,	200	Prince River.
Two mill ponds in east part,	Barre,	20	Burnshirt River.
† Hudson Reservoir or Gates Pond.	Berlin,	16	Branch of Assabet River.
Wheelers Pond,	Berlin,	19	Branch of North Brook.
Harris Pond,	Blackstone and Woonsocket.	106	Mill River.
Mill Pond, East Blackstone,	Blackstone,	20	Mill River.
South Pond,	Bolton,	39	Branch of Assabet River.
West Pond,	Bolton,	42	Branch of Assabet Brook.
Mill Pond in north part,	Boylston,	50	Nashua River.
Pond south of Boylston Center.	Boylston,	72	Muddy Brook.
Pond west of Boylston Center,	Boylston,	34	Nashua River.
Pout Pond,	Boylston,	16	None.
Rocky Pond,	Boylston,	86	Cold Harbor Brook.
Sewal Pond,	Boylston,	36	Brook.
Mill Pond southeast of Furnace Pond.	Brookfield,	13	Seven Mile River.
Mud Pond,	Brookfield,	10	Moores Brook.
* Quabaug or Podunk Pond,	Brookfield,	508	Quabaug River.
Pond east of above,	Brookfield,	42	Brook to Quabaug Pond.
Pond near West Brookfield line.	Brookfield,	32	Quabaug River.
Quacumquasit or South Pond,	Brookfield and Sturbridge.	340	Brook to Quabaug Pond.
Rices Pond,	Brookfield,	30	Mason Brook.
Rices Reservoir,	Brookfield,	16	Mason Brook.
Blood Pond,	Charlton and Dudley,	58	Branch of Quinabaug River.
Hicks Pond,	Charlton,	120	Cady Brook.
Lower Pond,	Charlton,	34	Little River.
Pond in west part,	Charlton,	20	Globe Brook.
Pond west of Charlton City,	Charlton,	25	Cady Brook.
Pond north of above,	Charlton,	15	Cady Brook.
Slaters Reservoir,	Charlton,	90	Little River.

Worcester County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
South Charlton Reservoir,	Charlton,	187	Brook.
Pond east of above,	Charlton,	12	Brook.
Upper Pond,	Charlton,	16	Little River.
Clam Shell Pond,	Clinton,	35	Branch of Assabet River.
Pond west of above,	Clinton,	51	Nashua River.
Ponds west of center,	Clinton,	133	Nashua River.
Sandy Pond,	Clinton,	75	Nashua River.
Neseponset Pond,	Dana,	118	Middle Branch of Swift River.
Pond south of above,	Dana,	40	Fever Brook.
Pottapaug Pond,	Dana,	160	East Branch of Swift River.
Sunk Pond,	Dana,	15	Branch of Middle Branch of Swift River.
Bad Luck Pond,	Douglas,	106	Brook to Reservoir.
Baiting Pond,	Douglas,	15	Brook.
Gilboa Pond,	Douglas,	17	Mumford River.
Reservoir,	Douglas,	470	Mumford River.
Wallum Pond,	Douglas and Burrillville, R. I.	105	Brook.
Willis Pond,	Douglas,	47	Brook to Reservoir.
Gore Pond,	Dudley and Charlton,	224	Brook to Charlton River.
Hayden Pond,	Dudley,	50	Brook to Pond south.
Pond south of above,	Dudley,	26	Brook to Pond south.
Larned Pond,	Dudley,	65	Brook to Merino Pond.
Pond northwest of above,	Dudley,	28	Brook to Larned Pond.
Merino Pond,	Dudley,	138	Branch of French River.
Peter Pond,	Dudley,	65	Brook to Merino Pond.
Pierpont Meadow Pond,	Dudley and Charlton,	92	Little River.
Pond in southeast corner,	Dudley and Webster,	16	Branch of French River.
Pond at Rockville,	Fitchburg,	24	Phillips Brook.
Pond in southwest corner,	Fitchburg,	22	Flagg Brook.
*†Crystal Lake,	Gardner,	216	Pond Brook.
Pond north of above,	Gardner,	17	Kneeland Brook.
Kendall Pond,	Gardner,	44	Branch of Otter River.
Mill Pond, South Gardner,	Gardner,	30	Brook.
Pond west of above,	Gardner,	22	Brook.
Pond west of Gardner Center,	Gardner,	38	Branch of Otter River.
Pond north of above,	Gardner,	25	Branch of Otter River.
Snake Pond,	Gardner,	18	None.

Worcester County — Continued.

Name	Town.	Approximate Area in Acres.	Outlet.
South Gardner Reservoir,	Gardner and Westminster.	77	Brook.
Flint Pond,	Grafton and Shrewsbury.	188	Brook to Hovey Pond.
Goddard Pond,	Grafton,	105	Quinsigamond River.
Pond in northeast part,	Grafton,	20	Miscoe Brook.
Silver Lake,	Grafton,	40	Miscoe Brook.
Mill Pond in east corner,	Hardwick,	18	Pond Hill Brook.
Pond northwest of above,	Hardwick,	20	Moose Brook.
Muddy Pond,	Hardwick,	67	Muddy Brook.
Pond north of above,	Hardwick,	26	Muddy Brook.
Pond in South Hardwick Center.	Hardwick,	15	Danforth Brook.
Bare Hill Lake,	Harvard,	320	Nonecanicus Brook.
Black Pond,	Harvard,	10	Beaver Brook.
Hell Pond,	Harvard,	33	Branch to Nashua River.
Robbins Pond,	Harvard,	11	Branch to Nashua River.
Chaffins Pond,	Holden,	92	Branch of Quinapoxet River.
Eagleville Pond,	Holden,	90	Quinapoxet River.
Kendall Reservoir,	Holden,	74	Quinapoxet River.
Pond at Quinapoxet Village,	Holden,	28	Quinapoxet River.
Pond at Unionville,	Holden,	20	Branch of Quinapoxet River.
Pond northwest of Eagleville,	Holden,	18	Quinapoxet River.
Rutland Pond,	Holden,	24	Trout Brook.
Worcester Reservoir,	Holden,	100	Tatnuck Brook.
Factory Pond,	Hopedale and Bellingham.	65	Charles River.
Asnacomet Lake,	Hubbardston,	238	Brook.
Bickford Pond,	Hubbardston,	37	Ware River.
Lovewell Reservoir,	Hubbardston,	90	Ware River.
Moosehorn Pond,	Hubbardston,	160	Brook to Ware River.
Natty Pond,	Hubbardston,	40	Natty Pond Brook.
Pond south of above,	Hubbardston,	17	Natty Pond Brook.
Reservoir in west corner,	Hubbardston,	38	Burnshirt River.
Sawyers Pond,	Hubbardston,	40	Hubbardston Brook.
Waite Pond,	Hubbardston,	47	Branch of Ware River.
Cranberry Pond,	Lancaster,	22	Cranberry Brook.
Fort Pond,	Lancaster,	118	None.
Little Spectacle Pond,	Lancaster,	23	Brook to Spectacle Pond.
Oak Hill Pond,	Lancaster,	33	North Branch Nashua River.
Spectacle Pond,	Lancaster,	94	Canoe Brook.

Worcester County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
Turners Pond,	Lancaster,	29	Bow Brook.
Whites Pond,	Lancaster and Leominster.	62	Branch of North Branch of Nashua River.
Burn Coat Pond,	Leicester and Spencer,	157	Brook to Cedar Meadow Pond.
Cedar Meadow Pond,	Leicester,	233	Burn Coat Brook.
Greenville Reservoir,	Leicester,	55	Brook to Rochdale Pond.
Grosvenor Reservoir,	Leicester,	50	Rawson Brook.
Pond southeast of above,	Leicester,	68	Rawson Brook.
Henshaw Pond,	Leicester,	69	Branch of French River.
Lower Pond, Cherry Valley,	Leicester,	16	Kettle Brook.
Manville Reservoir,	Leicester,	30	Kettle Brook.
Pond southeast of above,	Leicester,	10	Rawson Brook.
Middle Pond, Cherry Valley,	Leicester,	22	Kettle Brook.
Pond near Paxton line,	Leicester,	10	Kettle Brook.
Pond southwest of center,	Leicester,	13	Town Meadow Brook.
Rochdale Pond,	Leicester,	82	French River.
† Shaw Pond,	Leicester,	126	Shaw Brook.
Waite Pond,	Leicester,	43	Kettle Brook.
Worcester City Reservoir,	Leicester,	115	Kettle Brook.
Mill Pond at center,	Leominster,	19	Monoosnoc Brook.
Pond in southwest corner,	Leominster,	45	Branch of Justice Brook.
Reservoir,	Leominster,	508	Monoosnoc Brook.
Rocky Pond,	Leominster,	45	Brook to Reservoir.
Massapoag Pond,	Lunenburg,	80	Branch of Catacoonamug Brook.
Shirley Reservoir,	Lunenburg,	370	Catacoonamug Brook.
* Whalom Pond,	Lunenburg,	108	Massapoag Pond.
Nipmuck Pond,	Mendon,	160	Brook to Little Pond.
Cedar Swamp Pond,	Milford,	174	Charles River.
North Pond,	Milford,	67	Mill River.
* Dorothy Pond,	Millbury,	125	Dorothy Brook.
Lower Mill Pond, Bramanville.	Millbury,	12	Singletary Brook.
Pond northwest of village,	Millbury,	28	Blackstone River.
Ramshorn Pond,	Millbury and Sutton,	145	Ramshorn Brook.
Two continuous ponds near center.	New Braintree,	169	Sucker Brook.
Brooks Pond,	North Brookfield,	178	Five Mile River.
Horse Pond,	North Brookfield,	42	Branch of Five Mile River.
Lake Lashaway or Furnace Pond.	North Brookfield,	292	East Brookfield River.

Worcester County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
Pond in northwest part,	North Brookfield,	11	Meadow Brook.
Bartlett Pond,	Northborough,	58	Stirrup Brook.
Little Chauncey Pond,	Northborough,	42	Brook to Bartlett Pond.
Smiths Pond,	Northborough,	23	Branch of Assabet River.
Solomon Pond,	Northborough,	20	None.
Pond at Linwood,	Northborough,	30	Mumford River.
Pond at Rockdale,	Northbridge,	63	Blackstone River.
Pond southeast of above,	Northbridge,	24	Mumford River.
Swan Pond,	Northbridge,	41	Mumford River.
Whitins Pond,	Northbridge, Sutton and Uxbridge.	323	Mumford River.
Browning Pond,	Oakham and Spencer,	140	Seven Mile River.
Muddy Pond,	Oakham and Rutland,	75	Muddy Pond Brook.
Pond southeast of center,	Oakham,	25	Five Mile River.
Bugg Pond,	Oxford,	11	French River.
Carbuncle Pond,	Oxford,	16	None.
Lower Pond (Howarth's),	Oxford,	14	French River.
Lowes Pond,	Oxford,	39	Branch of French River.
Thayer Pond,	Oxford,	30	French River.
Robinsons Pond,	Oxford,	37	French River.
Pond on line of	Oxford and Sutton,	58	French River.
Popes Pond,	Oxford,	48	French River.
Upper Pond (Howarth's),	Oxford,	23	French River.
Asnebumskit Pond,	Paxton,	50	Asnebumskit Brook.
Bottomly Pond,	Paxton,	124	Kettle Brook.
Eames Pond,	Paxton,	40	Turkey Hill Brook.
Pond west of Pine Hill,	Paxton,	77	Asnebumskit Brook.
Upper Reservoir,	Paxton,	25	Brook to Bottomly Pond.
Reservoir,	Petersham and Athol,	136	Brook.
Reservoir south of above,	Petersham,	175	East Branch Fever Brook.
Phillipston Pond,	Phillipston,	202	Brook.
Browns Pond,	Phillipston and Templeton.	130	Burnshirt River.
Bates Pond,	Phillipston,	30	Branch of Beaver Brook.
Reservoir,	Phillipston and Athol,	130	Brook.
Lake Quinapoxet,	Princeton and Holden,	75	Quinapoxet River.
Osgood or Paradise Pond,	Princeton,	66	Keyes Brook.
Pond in east part,	Princeton,	17	Still Water River.

Worcester County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
Long Pond,	Royalston,	80	Tully River.
Pond east of center,	Royalston,	25	Lawrence Brook.
Pond south of center,	Royalston,	23	Lawrence Brook.
Demond Pond,	Rutland,	138	Brook to Long Pond.
Long Pond,	Rutland,	160	Long Pond Brook.
† Muschopauge Pond,	Rutland,	110	Quinapoxet River.
Pond in north part,	Rutland,	22	Ware River.
Pond west of center,	Rutland,	135	Long Pond Brook.
Turkey Hill Pond,	Rutland and Paxton,	83	Turkey Hill Brook.
* Jordan Pond,	Shrewsbury,	27	Branch of Quinsigamond River.
Pond northeast of above,	Shrewsbury,	15	Quinsigamond River.
Lake Quinsigamond,	Shrewsbury and Worcester.	673	Quinsigamond River.
Newton Pond,	Shrewsbury and Boylston.	33	Quinsigamond River.
Pond southeast of above,	Shrewsbury,	66	Quinsigamond River.
Brigham Pond,	Southborough,	18	Stony Brook.
Pond north of Fayville,	Southborough,	31	Stony Brook.
Pond southwest of Southville,	Southborough and Hopkinton.	18	Sudbury River.
Pond at Globe Village,	Southbridge,	38	Quinebaug River.
Pond at southeast corner,	Southbridge,	17	Brook.
Cranberry Meadow Pond,	Spencer and Charlton,	107	Cranberry Brook.
Pond in northeast corner,	Spencer,	24	Turkey Hill Brook.
Pond in Wire Village,	Spencer,	18	Turkey Hill Brook.
Pond south of Hillsville,	Spencer,	25	Seven Mile River.
Pond southwest from center,	Spencer,	12	Seven Mile River.
Stiles Reservoir,	Spencer and Leicester,	300	French River.
Whittemore or Moose Pond,	Spencer,	52	Seven Mile River.
East Waushacum Pond,	Sterling,	190	Brook to West Waushacum Pond.
Fitch Pond,	Sterling,	11	South Meadow Brook.
Pond in northwest part,	Sterling,	23	Justice Brook.
Pond northeast of center,	Sterling,	10	Wickapeket Pond.
West Waushacum Pond,	Sterling,	180	Branch of Still Water River.
Alum Pond,	Sturbridge,	282	Brook to Long Pond.
Cedar Pond,	Sturbridge,	182	Branch of Quinebaug River.
Pond north of above,	Sturbridge,	32	Brook to Cedar Pond.
Lead Mine Pond,	Sturbridge,	163	Lead Mine Brook.
Pond southeast of above,	Sturbridge,	22	Hammond Brook.

Worcester County — Continued.

Name.	Town.	Approximate Area in Acres.	Outlet.
Long Pond Reservoir,	Sturbridge,	65	Branch of Quinebaug River.
Walker Pond,	Sturbridge,	152	Hobbs Brook.
Clarks Reservoir,	Sutton,	53	Cold Spring Brook.
Manchaug Lake,	Sutton and Douglas,	360	Brook to next pond.
Pond north of above,	Sutton,	22	Mumford River.
Pleasantdale Pond,	Sutton,	77	Cold Spring Brook.
Pond at West Sutton,	Sutton and Oxford,	18	Brook.
Pond in Wilkinsonville,	Sutton,	32	Blackstone River.
Pond north of above,	Sutton,	31	Blackstone River.
Pond north of Manchaug Village.	Sutton,	30	Brook to next pond.
Pond southwest of Manchaug Village.	Sutton,	136	Brook to next pond.
Sibley Reservoir,	Sutton,	61	Cold Spring Brook.
Singletary Pond,	Sutton and Millbury,	440	Singletary Brook.
Two ponds southwest of above,	Sutton,	46	Singletary Brook.
Browns Pond,	Templeton,	23	Burnshirt River.
Lower Pond east of Brooks Village.	Templeton,	25	Trout Brook.
Middle Pond east of Brooks Village.	Templeton,	25	Trout Brook.
Pond at Baldwinsville,	Templeton,	14	Otter River.
Pond at East Templeton,	Templeton,	96	Branch of Otter River.
Pond at Partridgeville,	Templeton,	56	Branch of Otter River.
Upper Pond east of Brooks Village.	Templeton,	26	Brook to Lower Pond.
Jourdans Pond,	Upton,	52	West River.
Pratts Pond,	Upton,	25	Centre Brook.
Zachary Pond,	Upton,	24	West River.
Black Pond,	Uxbridge,	13	None.
Chockalog Pond,	Uxbridge,	22	Nipmuck River.
Ironstone Reservoir,	Uxbridge and North Smithfield.	53	Branch of Blackstone River.
Pond at North Uxbridge,	Uxbridge,	24	Mumford River.
Pond northeast of above,	Uxbridge,	30	Blackstone River.
Pond at Uxbridge Village,	Uxbridge,	18	Mumford River.
Pond northeast of Uxbridge Village.	Uxbridge,	20	Blackstone River.
Pout Pond,	Uxbridge,	13	West River.
Reservoir,	Uxbridge and Sutton,	186	Mumford River.
Kingsbury Pond,	Webster,	40	Sucker Brook.
†*Lake Chaubunagungamaug,	Webster,	1,188	Mill Brook.
Nipmuck Pond,	Webster,	24	Sucker Brook.

Worcester County — Concluded.

Name.	Town.	Approximate Area in Acres.	Outlet.
Pond in north part,	West Boylston,	14	Shaker Brook.
Wickaboag Pond,	West Brookfield,	323	Branch of Quaboag River.
Cedar Swamp Pond,	Westborough,	15	Sudbury River.
Hocomonoc Pond,	Westborough,	31	Branch of Assabet River.
Lake Chauncey,	Westborough,	185	Brook to Little Chauncey Pond.
Coolidge and Adams Reservoir.	Westminster,	70	Whitmans River.
Grassy Pond or Wyman Reservoir.	Westminster,	26	Branch of Flagg Brook.
† Meeting House Pond,	Westminster,	172	Brook to Grassy Pond or Wyman Reservoir.
Merriams Reservoir,	Westminster,	31	Whitmans River.
Minot Pond,	Westminster,	31	Brook to South Gardner Reservoir.
Muddy Pond,	Westminster,	78	Branch of Whitmans River.
† Wachusett Lake,	Westminster and Princeton.	250	Brook to Grassy Pond.
Bullardville Pond,	Winchendon,	20	Branch of Millers River.
Carter or Stoddard Pond,	Winchendon,	54	Branch of Otter River.
Denison Lake,	Winchendon,	87	Branch of Millers River.
Part of Monomac Lake,	Winchendon and Rindge.	114	Millers River.
Pond,	Winchendon and Ashburnham.	100	Millers River.
Pond west of North Ashburnham Depot.	Winchendon,	44	Millers River.
Reservoir,	Winchendon,	122	Branch of Millers River.
Upper Mill Pond, North Village.	Winchendon,	81	Millers River.
Coes Reservoir,	Worcester,	122	Tatnuck Brook.
Curtis Pond,	Worcester,	78	Blackstone River.
North Pond,	Worcester,	170	Mill Brook.
Pond, Quinsigamond Village,	Worcester,	24	Blackstone River.
Pond in southwest corner,	Worcester,	47	Kettle Brook.
Salisbury Pond,	Worcester,	17	Mill Brook.
Pond south of South Worcester.	Worcester,	16	Blackstone River.
Reservoir in northwest part,	Worcester,	32	Tatnuck Brook.
Reservoir southeast of Tatnuck Village.	Worcester,	35	Tatnuck Brook.
Reservoir south of above,	Worcester,	14	Tatnuck Brook.

INDEX.

INDEX.

Commissioner's Report.

	PAGE
Allens Harbor, Harwich,	114
Annisquam River,	58
Apponagansett Harbor,	114
Appropriation for Survey and Improvement of Harbors,	159
Barnstable Harbor,	115
Bass River, Beverly,	115
Bass River, Yarmouth,	6
Beverly Harbor,	6
Boston Harbor,	11
Bucks Creek, Chatham,	33
Buzzards Bay, Falmouth,	34
Cape Cod Canal,	160
Cataumet Harbor,	34
Centreville River,	35
Cohasset Harbor,	35
Conclusion,	173
Concord River, Billerica,	115
Connecticut River,	37
Agawam,	37
Chicopee,	37
Hatfield,	38
Cotuit Harbor,	115
Cuttyhunk Harbor,	49
Deacons Pond Harbor, Falmouth,	116
Duxbury Bay and Harbor,	50
East Bay, Osterville,	116
Edgartown Harbor,	128
Eel Pond Channel, Falmouth,	109
Essex River,	117
Fall River Harbor,	129
Gloucester Harbor,	51
Great Ponds,	152
Green Harbor,	117
Harbor Cove, Gloucester,	56
Haulover Beach, Nantucket,	84
Hearings, Inspections, etc.,	3
Herring River, Harwich,	61
Herring River Dike, Wellfleet,	117
Housatonic River,	118
Hull Sea Wall,	62
Humarock Beach, Scituate,	118
Hyannis Harbor,	63
Hyannisport,	63
Improvement and Protection of Rivers, Harbors, Tide Waters and Foreshores,	4
Inspection by Congressional Committee,	172
Ipswich River,	118

PAGE
Lake Anthony, ... 119
Lake Quannapowitt, ... 154
Lewis Bay, Hyannis, ... 63
Licenses granted during the Year, ... 162
Little Pond, Falmouth, ... 154
Little River, Gloucester, ... 61
Lobster Cove, Gloucester, ... 59
Long Pond, Harwich, ... 155
Lynn Harbor, ... 68
Manchester Harbor, ... 77
Marion Harbor, ... 137
Massachusetts Atlas Sheets and Town Boundary Atlases, ... 159
Menamsha Inlet, ... 78
Merrimac River, ... 144
Mill River, Gloucester, ... 60
Miscellaneous Permits granted during the Year, ... 171
Nantucket Harbor, ... 79
New Bedford and Fairhaven Harbors, ... 137
Newburyport Harbor and Merrimac River, ... 144
Nonquitt, Dartmouth, ... 85
Nontidal Rivers and Streams, ... 155
North River, ... 120
Oak Bluffs, ... 120
Onset Bay, ... 85
Pamet River, Truro, ... 86
Paskamansett River, ... 86
Penikese Island, ... 121
Plum Island River, ... 121
Plymouth Harbor, ... 87
Pollock Rip Channel, ... 146
Province Lands, ... 156
Provincetown Harbor, ... 147
Quansett Harbor, Orleans, ... 121
Quicks Hole, Gosnold, ... 122
Revere Breakwater, ... 122
Rock Harbor, Orleans, ... 91
Rockport Harbor, ... 123
Salem Harbor, ... 92
Salter's Point, Dartmouth, ... 96
Sandwich Harbor, ... 97
Saugus River, ... 100
Scituate Harbor, ... 101
Scituate Sea Walls, ... 123
Scorton Harbor, Sandwich, ... 124
Sesuit Harbor, Dennis, ... 125
South River, Salem, ... 95
South Watuppa Pond, ... 155
Stage Harbor, Chatham, ... 125
Taunton River, ... 104
Taunton River–Boston Harbor Canal, ... 126
Town Boundary Survey, ... 157
United States, Expenditures on River and Harbor Improvements, . . . 31
Vineyard Haven Harbor, ... 106
Waquoit Bay, ... 126
Wareham River, ... 151
Watch Hill, Chatham, ... 126

PAGE
Wellfleet Harbor, ... 152
West Bay, Osterville, ... 127
West Falmouth Harbor, ... 127
Weymouth Back River Bridge, ... 172
Wild Harbor, Falmouth, ... 107
Witchmere Harbor, Harwich, ... 107
Woods Hole, Falmouth, ... 109
Wrecks and Obstructions, ... 160

APPENDIX.

Appropriations, Contributions and Expenditures, ... 183
Contracts made and pending during the Year 1913, ... 179
Contributions and Expenditures under Chapter 481, Acts of 1909, and Chapter 642, Acts of 1912, ... 181
List of Ponds, ... 186